The American Journal of Surgery

EDITED BY THURSTON SCOTT WELTON, M.D.

July 1944

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Fifty-third Year of Continuous Publication

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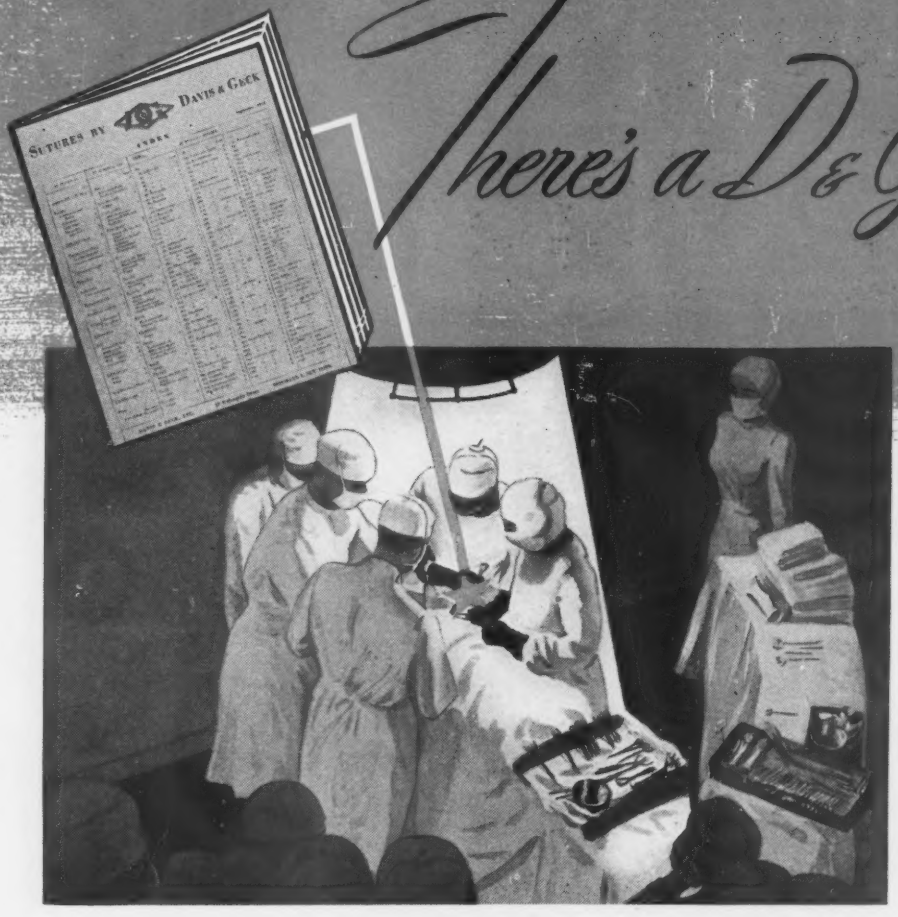

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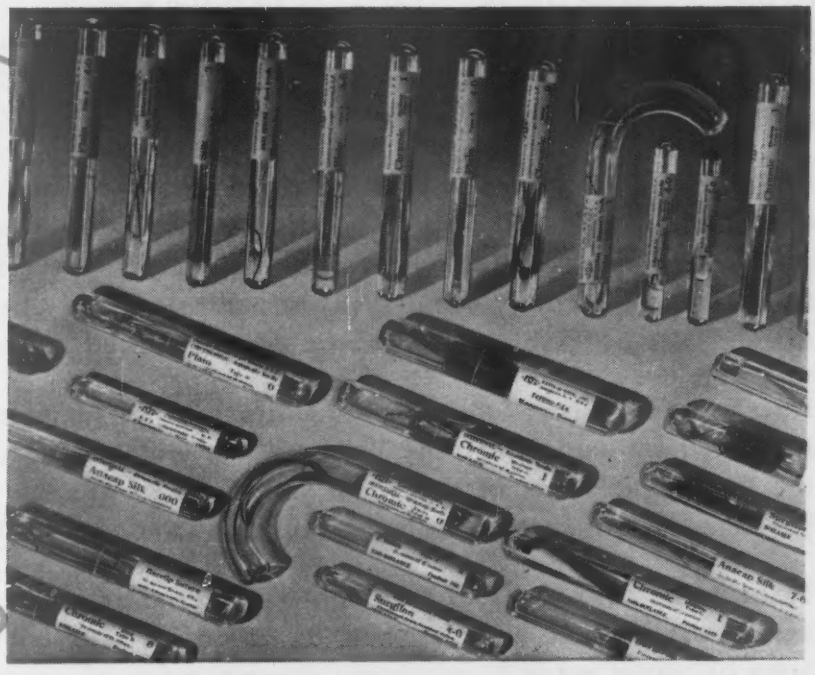

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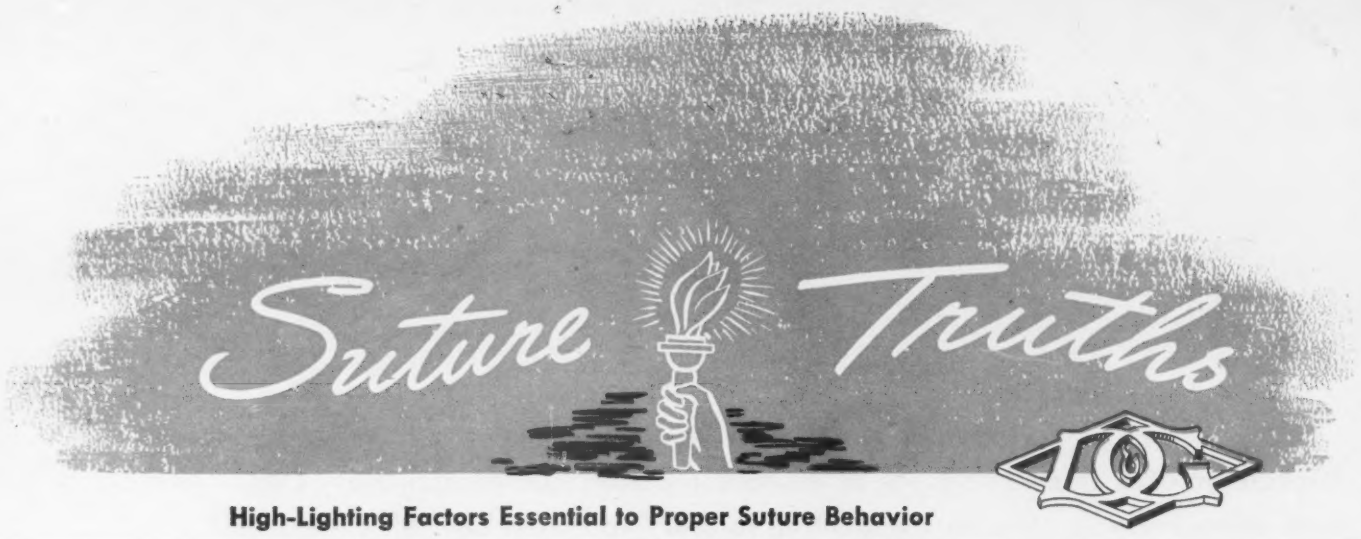

High-Lighting Factors Essential to Proper Suture Behavior

Control of Basic Materials Important to Suture Quality

In the making of sutures the highest standards of quality can be achieved and maintained only if careful control is exercised over the selection of basic materials. Especially is this true of catgut whose physical characteristics depend to a large degree on the quality of the animal tissue from which the strands are fabricated. Among the factors which must be rigidly controlled are:

1. Freshness. The structure and integrity of animal tissues are altered by bacterial action and likewise depreciated by use of chemical preservatives or freezing. Therefore, catgut of superior strength, flexibility and securely bonded ply structure can only be produced through use of fresh materials from recently killed animals.

2. Physiologic quality. Strength and uniformity of diameter are also improved by using only the "smooth" or outer curvature half of the first eight yards of the small intestines of animals free from pathogenic or dietectic conditions causing variance in wall thickness.

3. Maturity of animals. The selection of material at proper stages of animal maturity has a further bearing on quality. For example, small sizes of catgut made from several narrow strips of intestinal tissue taken from a young animal are superior to strands of the same size comprised of fewer but wider strips taken from a larger animal.

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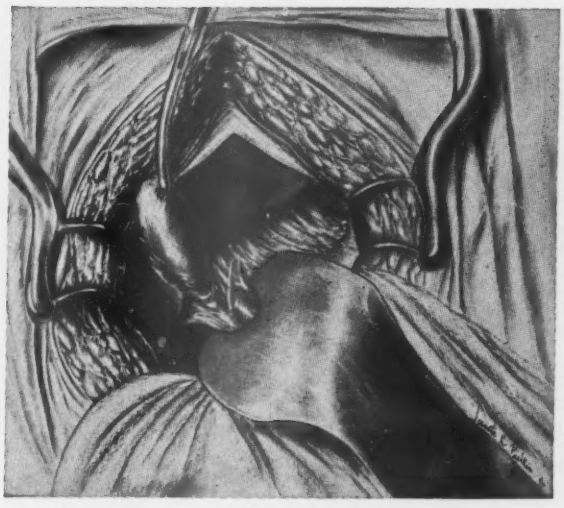

Illustration demonstrating the use of this new retractor, with the notched end exposing the cystic and common bile ducts, portal vein and the hepatic artery.

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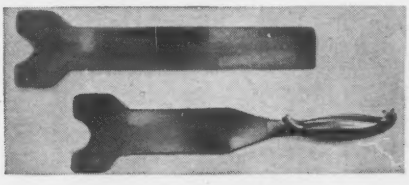

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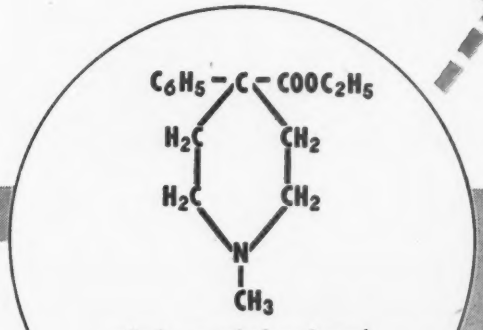

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SUTURES

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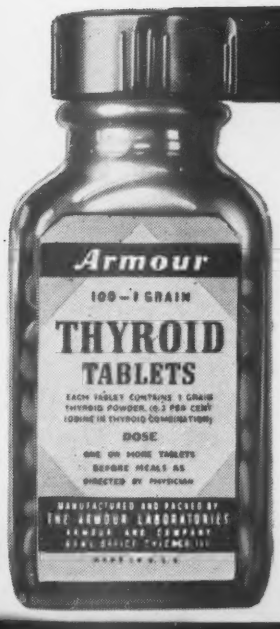

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. . . . . .

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b. **A***ction on growth and differentiation.*

c. **A***ction on the nervous, muscular and circulatory systems.*

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THYROIDECTOMY

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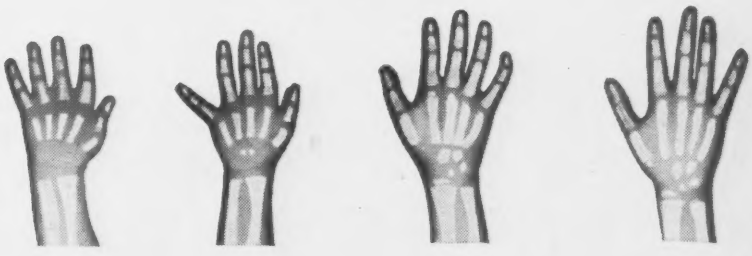

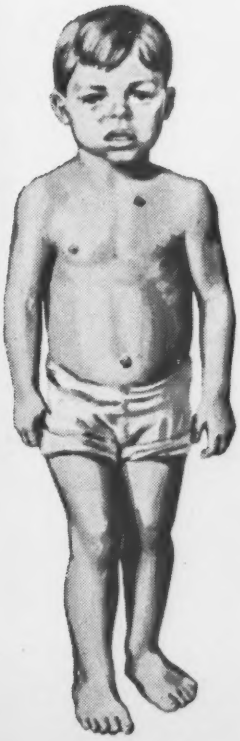

CRETINISM

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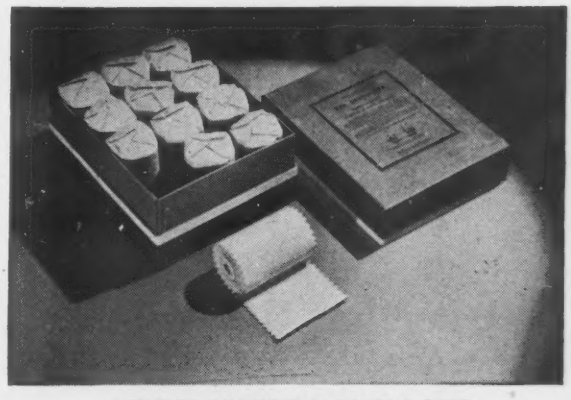

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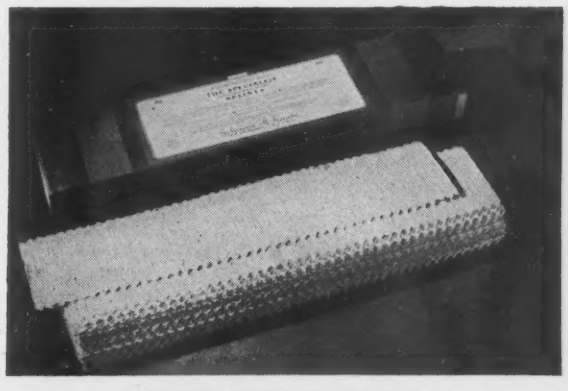

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The Lancet 2:729-731, Dec. 11, 1943

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The physician can accurately predict the response in patients with uncomplicated pernicious anemia when Solutions Liver Extract, Lilly, are administered in regular and adequate doses. Predictable results are made possible because each manufactured lot is clinically standardized on known cases of pernicious anemia in relapse. In the average uncomplicated case, Solutions Liver Extract, Lilly, will produce a standard reticulocyte response and cause the red-blood-cell count to return to normal within a period of sixty days. Eli Lilly and Company, Indianapolis 6, Indiana, U.S.A.

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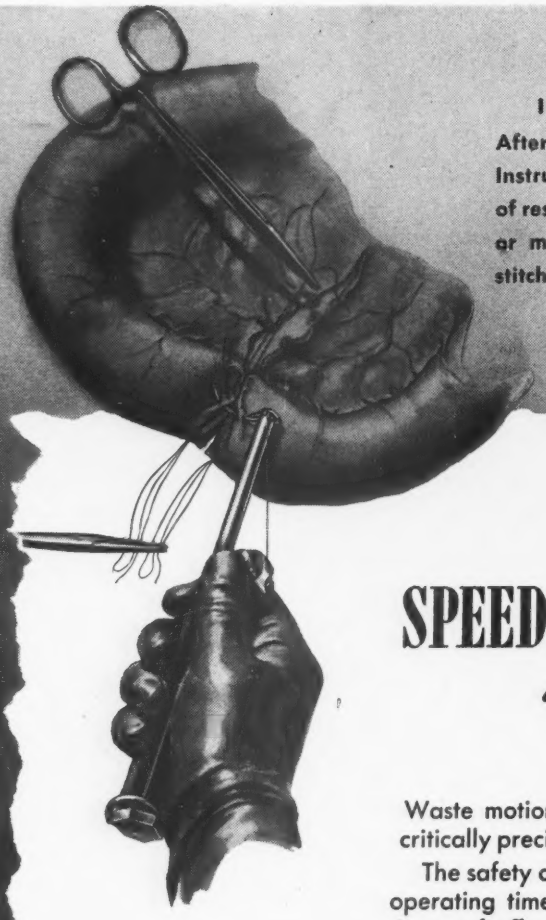

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After completing basting stitch, Singer Instrument proceeds to approximate ends of resected bowel with simple interrupted or mattress stitch. Half-locked basting stitch is then removed.

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SPEED AND EFFICIENCY

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—unites needle, holder, suture supply, and severing edge in one self-contained instrument, sterilizable as a complete unit.

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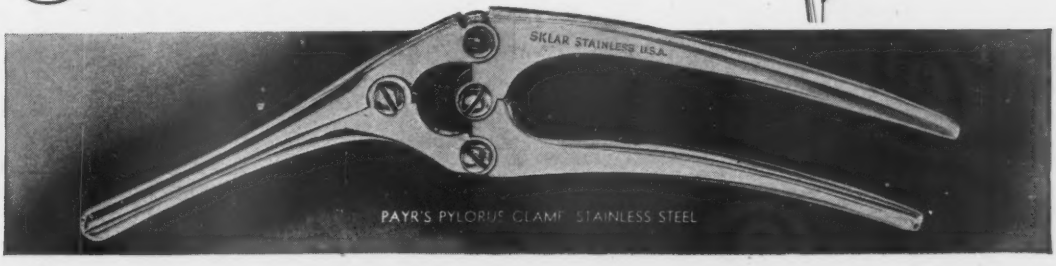

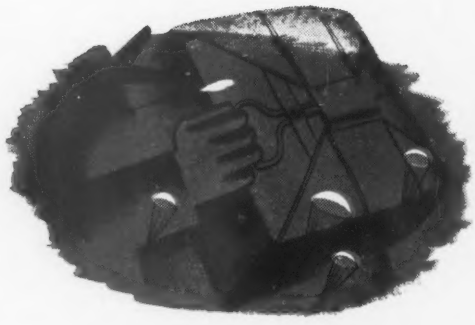

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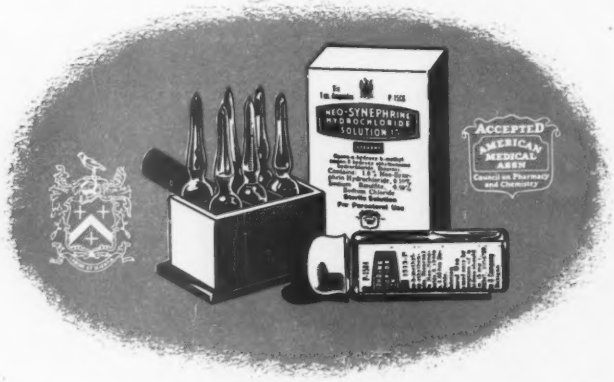

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Every member of the medical profession will be tremendously interested in the news that PANTOPAQUE—the new contrast medium for myelographic work—is now available for civilian use.

KELEKET PANTOPAQUE demonstrates remarkably accurate detail. In many cases the whole course of the nerve root may be shown at each level. After-effects are minimal and the entire spinal canal can be readily and quickly examined. New, but not experimental, PANTOPAQUE has been thoroughly tested by both the Army and Navy, which use no other contrast medium for myelographic work.

Characterized by high fluidity, PANTOPAQUE is only a small fraction as viscous as iodized oils formerly used for the same purpose. It is, therefore, easily aspirated. When diagnosis has been completed, PANTOPAQUE—which tends to remain in the form of a single globule—is easily collected under the needle and ninety per cent of the medium may be withdrawn almost immediately. Any residuum is quickly absorbed into the system. Often the entire operation—from injection through aspiration—is accomplished in less than twenty minutes.

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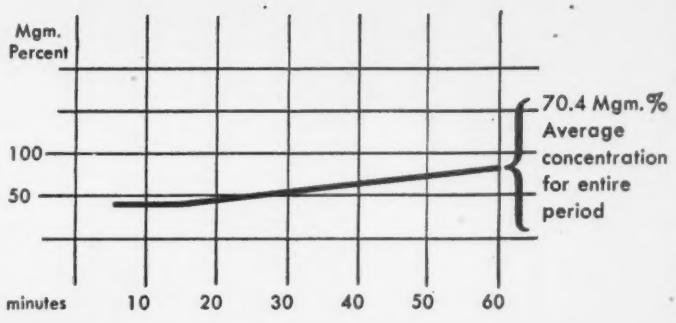
One tablet chewed for one hour promptly initiates and maintains a *high* concentration of *locally active* sulfathiazole, averaging 70 mgm. percent saliva over the period of an hour's chewing. Two tablets increases the concentration approximately 20 percent.



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THE unique value of this new, effective method for the *local* treatment of certain throat infections consists in this:

1. Chewing one tablet provides a *high* salivary concentration (70 mg. per cent) of *dissolved* sulfathiazole . . .

2. that is *maintained* in immediate and *prolonged* contact with oropharyngeal areas which are not similarly reached by gargles or irrigations. . . .

3. Chewing two tablets increases this concentration by 20 per cent . . .

4. with a relatively small ingestion of the drug, with either dosage, and consequent negligible systemic absorption.

Typical infections which have shown excellent response to treatment with White's Sulfathiazole Gum are acute tonsillitis and pharyngitis, septic sore throat, infectious gingivitis and stomatitis caused by sulfonamide-susceptible micro-organisms. Also indicated in the prevention of local infection secondary to oral and pharyngeal surgery.

Supplied in packages of 24 tablets, sanitaped in slip-sleeve prescription boxes—*on prescription only*. White Laboratories, Inc., Pharmaceutical Manufacturers, Newark 7, N. J.

White's

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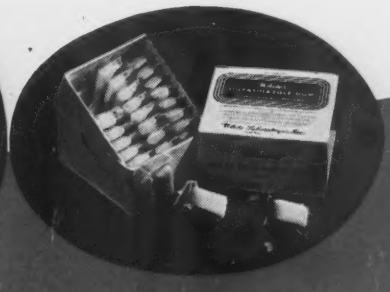

Hold fast to a good habit

On the question of continuing vitamin D throughout the summer, Park[1] maintains that, "Practically, it is a good policy... interruption often breaks down the habit on the part of the mother as well as child and makes resumption difficult or impossible." Other investigators have demonstrated the development of deficiency even in sunny summer climates.

For year-round use, Super D* Concentrate offers the advantages of a specially defatted natural preparation which supplies vitamin D exclusively from cod liver oil and vitamin A from cod and other selected fish liver oils. It is easy to digest even in the hottest weather and is well tolerated by the youngest infant.

In summer as well as in winter, for routine administration of drop dosage vitamin D, use Super D Concentrate. Five "standardized" drops (1.72 minims) daily supply 500 U. S. P. units of vitamin D and 5,000 U. S. P. units of vitamin A. Available in 5 cc., 10 cc., and 30 cc. bottles.

*Trademark Reg. U. S. Pat. Off.

(1) Park, E. A.: J.A.M.A. 115: 370-379 (Aug. 3) 1940.

Upjohn
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Super D Concentrate

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(Squibb Stabilized Aqueous Solution Sulfathiazole Sodium (2.5%) with dl-desoxyephedrine hydrochloride (0.125%))

Aids in Relieving Blocked Sinuses

Sulmefrin contains desoxyephedronium sulfathiazole—a combination having the antibacterial properties of sulfathiazole with the proved vasoconstrictive action of ephedrine-like compounds.

Clinical studies have shown that Sulmefrin facilitates drainage and ventilation, generally producing prompt and prolonged vasoconstriction without such side-effects as sneezing, tachycardia or nervousness. It is mildly alkaline (pH approx. 9.0) and this, according to Turnbull, is preferable for nasal medication because (1) of high antibacterial activity in the pH range 8 to 10, and (2) it allows continuation of ciliary motion for a long period of time.

Sulmefrin may be administered by spray, drops or tamponage. It is supplied in 1-oz. dropper packages and 1-pint bottles. The solution is pink-tinted.

Sulmefrin—for intranasal treatment of

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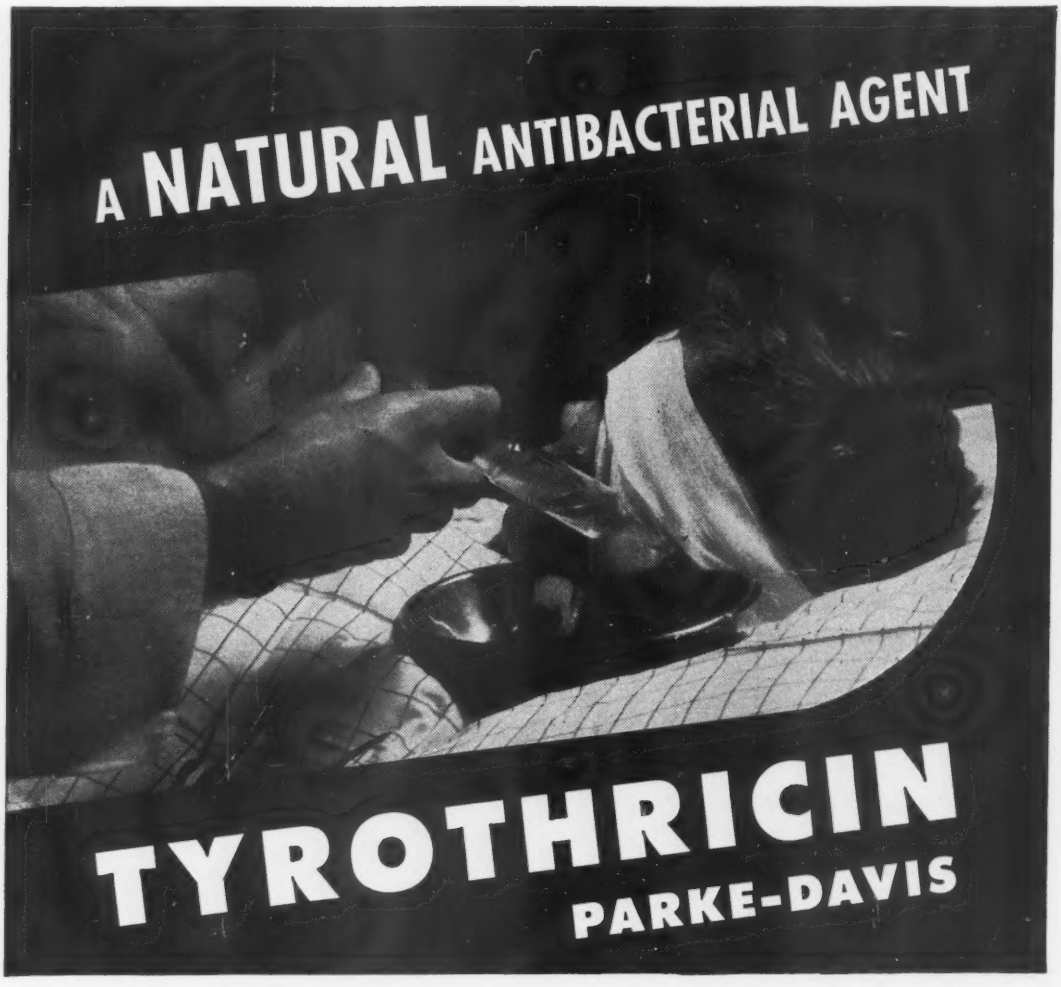

OBTAINED from the aerobic spore bearing soil bacterium, *Bacillus brevis*, PARKE-DAVIS TYROTHRICIN is effective against certain gram-positive organisms including pneumococci, staphylococci, streptococci, diphtheria bacilli, and others.

Use by local application: wet pack, instillation, or irrigation, in treatment of abscesses . . . infected wounds . . . indolent ulcers . . . chronic ear infections . . . empyema infections of nasal sinus . . . and following mastoidectomy.

TYROTHRICIN, Parke-Davis, is supplied in 10 cc. vials, as a 2 per cent solution, to be diluted with sterile distilled water before use. It is for topical use only—*not to be injected.*

Parke, Davis & Company

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The CHAS. BRADFORD CASSETTE HOLDER

$75.00

[F.O.B. Seattle, Wash.]

- Construction assures accurate radiographs in both lateral and anterior views.
- Radiographs readily taken without disturbing drapes or moving patient.
- Fits any sized patient.
- Can be fitted to any standard fracture table.
- Light, portable, easily carried under one arm for use at several hospitals.
- Director attached for accurate lateral view.
- Makes possible absolute immobilization of fracture during pinning.
- Minimizes the danger of contamination.
- Removable perineal post with air-foam rubber padding combines comfort for patient and strength for traction.
- Excellent for nailing or pinning of intracapsular fractures, intertrochanteric fractures and pelvic fractures.

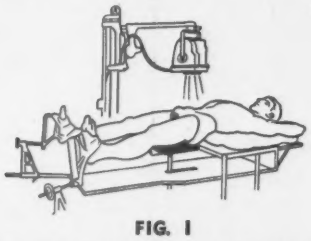

FIG. I

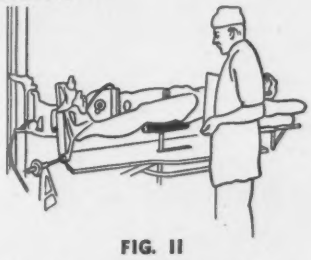

FIG. II

Fig. I—*The anterior tube is centered over the lateral aspect of the shaft, one inch distal to the greater trochanter.*
Fig. II—*Tube shifted from anterior to lateral position with center of tube in line with lateral x-ray director without moving either legs or disturbing drapes. Cassette Holder is placed in pillow case and held very snugly above crest of the ilium directly opposite the opening of x-ray tube.*

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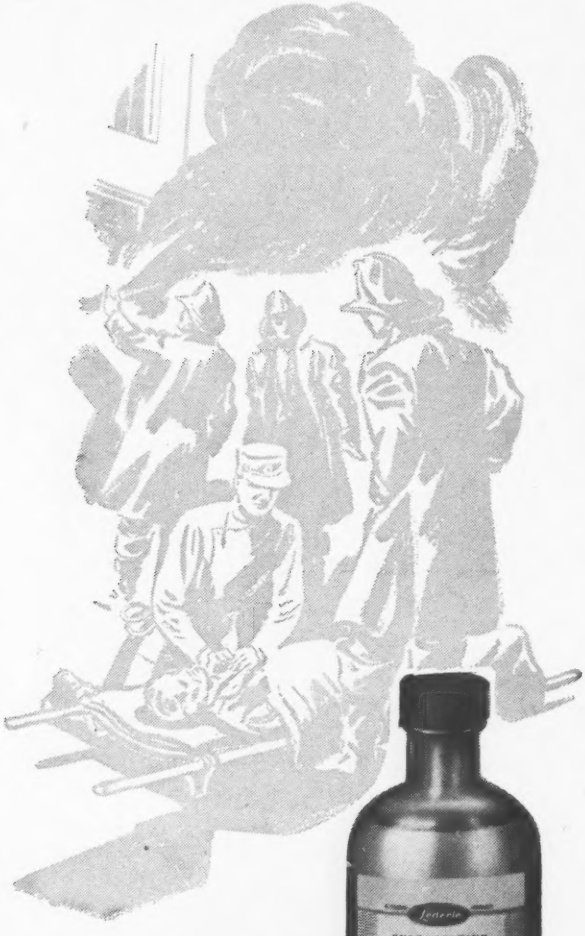
The local and constitutional bacteriostatic treatment of burns with . . .



Sulfadiazine
Lederle

BACTERIOSTASIS is essential for healing in extensively burned areas. This may be achieved by appropriate surgical and medical measures adopted immediately after the injury is received. The most important bacteriostatic measure is the use of sulfonamides.

SULFADIAZINE *Lederle* may be employed locally in the form of "SULFADIAZINE IN ETHANOLAMINES SOLUTION (PICKRELL) *Lederle*," or "SULFADIAZINE OINTMENT *Lederle*."

SULFADIAZINE *Lederle* may be given by mouth if drug blood levels remain insufficient to inhibit bacterial growth. Caution should be observed in the simultaneous use of oral and local therapy since excessive drug blood levels may result. Maintenance of urinary output between 1,000 and 1,500 cc. daily and an alkaline urine are advisable during intensive Sulfadiazine therapy.

PACKAGES

SULFADIAZINE OINTMENT 5%
1 ounce tube, ¼ and 1 pound jars

SULFADIAZINE-TANNIC ACID JELLY
(Sulfadiazine, 5%—Tannic Acid, 10%)
1 ounce tube, ¼ and 1 pound jars

SULFADIAZINE SURGICAL POWDER STERILE
5 Gm. in vial

SULFADIAZINE OPHTHALMIC OINTMENT
(*Sulfadiazine* 5%)
⅙ ounce tube

SULFADIAZINE IN ETHANOLAMINES SOLUTION*
(*Pickrell*)
8 fluid ounces and 1 pint (16 fluid ounces)

**Accepted by the Council on Pharmacy and Chemistry of the American Medical Association.*

LEDERLE LABORATORIES INC.
A UNIT OF AMERICAN CYANAMID COMPANY
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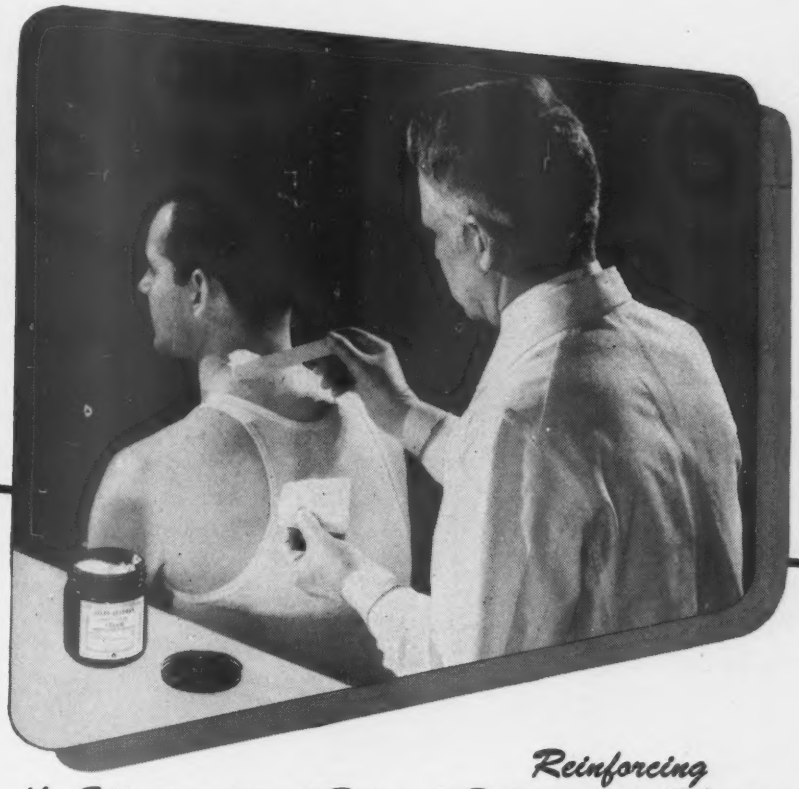

Reinforcing
the Effectiveness of Topical Sulfonamide Therapy

Sulfa-Ceepryn Cream, the improved sulfonamide cream reinforced with a germicidal detergent, is an important contribution to the therapy of pyogenic infections and burns, wounds and other lesions where infection is threatened.

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Brand

Sulfathiazole, Sulfanilamide and Cetylpyridinium Chloride

CREAM

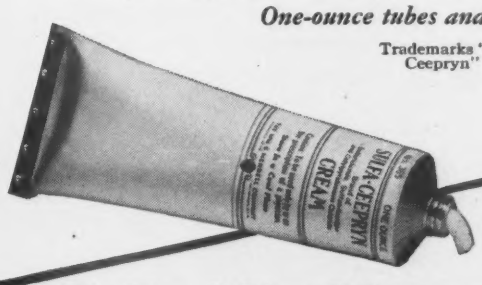
COMBINATION OF SULFONAMIDES—Sulfathiazole 10% and sulfanilamide 10% provide *rapid* and *prolonged* bacteriostatic action of wider scope.

REINFORCED WITH CEEPRYN—Cetylpyridinium chloride 1:500 reinforces the sulfonamides with its powerful germicidal action, and its marked detergency aids penetration.

WATER-SOLUBLE BASE—A special vanishing cream base spreads evenly and releases medication readily.

One-ounce tubes and one-pound jars

Trademarks "Ceepryn" and "Sulfa-Ceepryn" Reg. U. S. Pat. Off.



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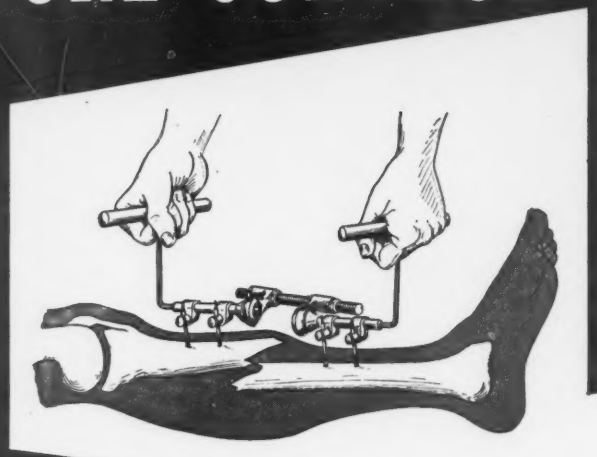
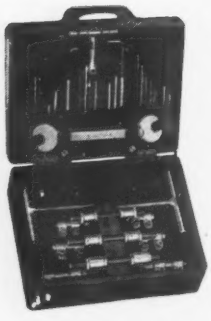


Application of Zimmer Reduction-Retention Apparatus to a fracture of the tibia with shortening and displacement. The reduction is accomplished by means of removable handles or wrenches, extension being provided for by the threaded rod.



Complete outfit of three sizes, including necessary tools and accessories, is available in fitted case.

● The new Zimmer Reduction-Retention Apparatus offers surgeons a number of advantages. It can make the patient ambulatory within 24 hours after operation. It functions as a reduction apparatus, and also as an external fixation splint. It holds the fragments in position more securely than by means of plaster, or other splinting. It enhances circulation and hastens union. There is no interference with use of X-Ray during reduction, or with check-ups at later periods. Useful for impacting fractures, or for bone lengthening. Ideal for external fixation in cases of bone grafting. Later adjustments can be made, if necessary, with minimum inconvenience to both surgeon and patient.

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MANUFACTURING CO., WARSAW, IND.

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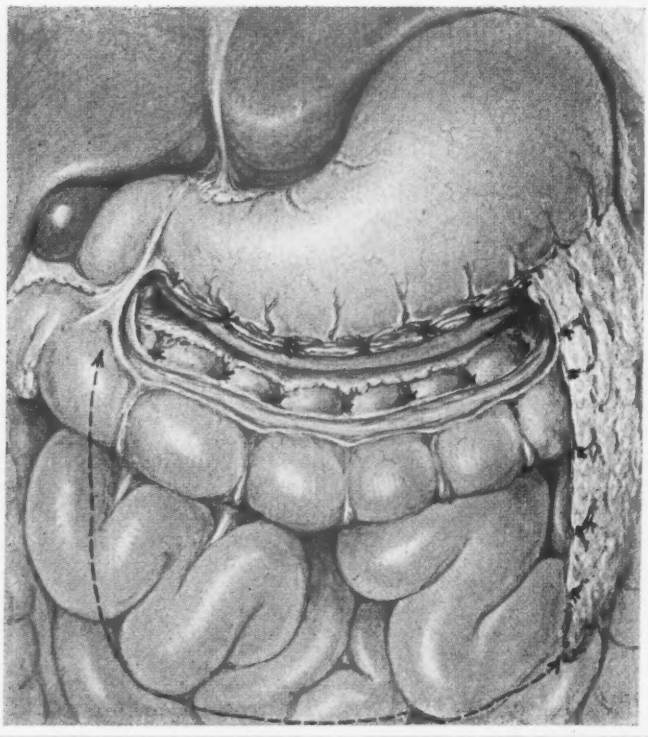
ETHICON SUTURE LABORATORIES, DIVISION OF JOHNSON & JOHNSON, NEW BRUNSWICK, N. J.

ANTERIOR GASTROENTEROSTOMY

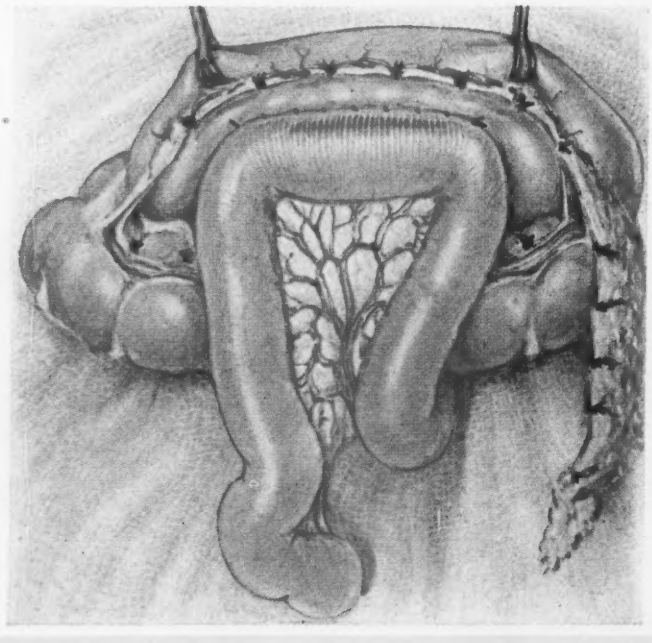
FRANK H. LAHEY, M.D., F.A.C.S., Boston, Mass.

Illustrated in Color by Special Permission of the Author

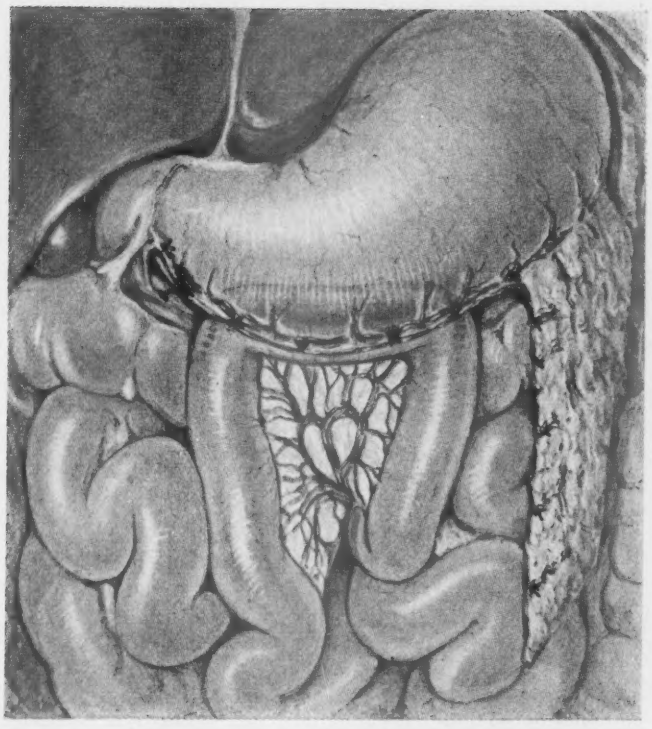
(Paintings based on Lahey Clinic Drawings in Surgery, Gynecology and Obstetrics, February, 1944.)



1. Stomach after omentum has been resected. Resection has been continued well to the left side so that greater curvature is completely free. The stomach can be lifted easily now so that anastomosis can be initiated.



2. Greater curvature of stomach supported by Babcock clamps. The residual gastric contents gravitate toward esophagus. The jejunum is attached just behind the edge of the greater curvature. The absence of omental attachments facilitates mobilization.



3. Anterior gastroenterostomy completed. The stoma may be any logical size. No anastomosis is necessary between the afferent and efferent loops of the jejunum in this procedure.

Ethicon Surgical Gut Advantages

- **TRU-GAUGING** — 6 times greater gauge uniformity than U. S. P. requirements.
- **TRU-CHROMICIZING** — uniform distribution of chrome from center to periphery.
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Ethicon Suture Laboratories produces a complete line of absorbable and non-absorbable sutures, in standard gauges and sizes, and in a wide range of materials.

Surgical Gut • Nylon • Silk • Cotton • Linen • Horsehair
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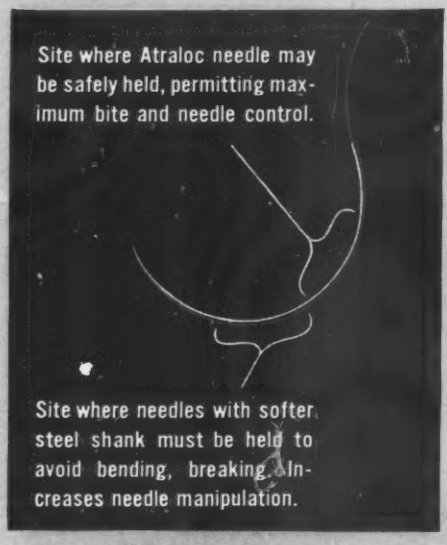
Special Sutures—equipped with Eyeless Atraloc Needles

ETHICON *Sutures*

Surgical Gut with Lock-Knot Finish

Needle bending and breaking minimized

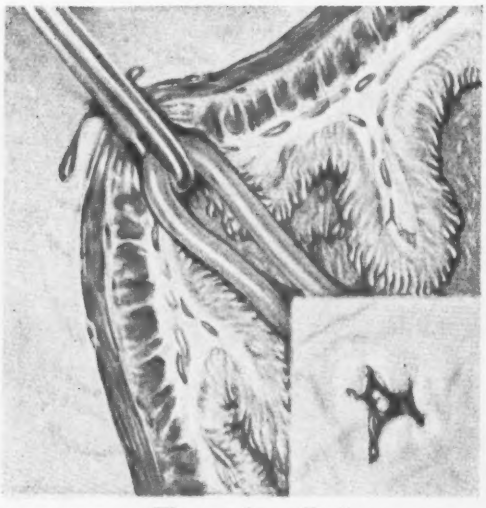
Atraloc Eyeless Needles facilitate surgical skill and dexterity with safety


Site where Atraloc needle may be safely held, permitting maximum bite and needle control.
Site where needles with softer steel shank must be held to avoid bending, breaking. Increases needle manipulation.

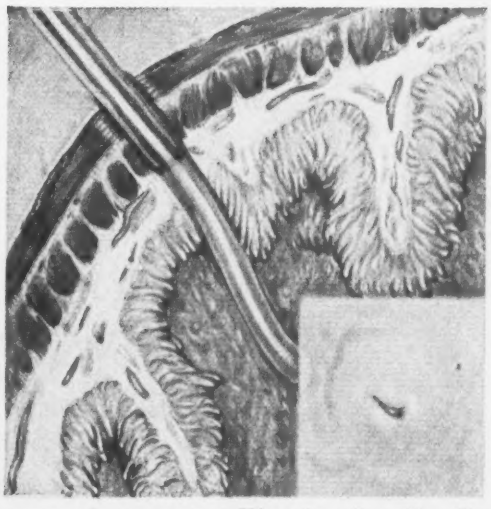
• The more highly tempered steel shank in Atraloc Eyeless Needles gives them greater strength and rigidity in use. A full bite can be taken with confidence when an Atraloc Needle is used to achieve tissue approximation. This greater efficiency eliminates extra manipulations and saves operating time, without increasing breaking hazards.

The shank of the Atraloc Needle is swaged to the suture by a special process. This process permits a relatively high temper just below the shank where strength counts most. Atraloc Needles hold on pulls in excess of U.S.P. tensile strength requirements for sutures pulled over a surgeon's knot.

ATRALOC NEEDLES for minimal suture trauma



EYED NEEDLE: The eyed needle does greater injury to tissue because it pulls a looped suture in its wake.



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Editorial

THE SIGNIFICANCE OF TRANSILLUMINATION OF THE CERVIX UTERI

THE cervix, before it is damaged by infection, parturition or operation, is neatly arranged with columnar epithelium lining the canal in a definite pattern and terminating abruptly at the small external os.

Parturition leaves the external opening relaxed and the endocervical mucosa hyperactive. The increase in alkaline mucus makes conditions unfavorable for the squamous epithelium covering the portio, and for a variable distance around the external os it is replaced by columnar epithelium in the form of the familiar so-called erosion.

As the uterus recovers from the effects of pregnancy and parturition, the activity of the columnar epithelium subsides and the quantity of mucus decreases. This allows the squamous epithelium to replace the columnar over the portio. If the portio has not been invaded by deep-growing glands, the erosion may disappear, leaving the cervix in approximately normal condition.

In a large proportion of cases this happy result does not occur. The gland-bearing columnar epithelium penetrates the portio and some of the glands become cystic. These may be superficial cysts, the size of a millet seed, or they may be larger and deeper. The cervix may be mottled by intermingled islands of the two types of epithelium, or the entire surface may be recovered by squamous epithelium. Under this second growth may be found cysts which have not been rooted out by the regrowing squamous epithelium.

The cervix, therefore, becomes a battleground of epithelial types and may remain so during the period through which children are born.

Erosions, superficial cysts and leucoplakia are easily seen with proper lighting, but the underlying tissue of the portio remains out of sight unless the examiner resorts to transillumination.

Transillumination reveals the more deeply-buried cysts, which shine out as clear areas if mucus-filled. Often there is a sediment of pus in the cyst which makes a dark center to the light cyst. This sediment is often visible, with ordinary illumination, as a white spot showing through the mucosa. Therefore, when a white spot of pus is seen, one can predict with confidence that it is in a cyst.

The healthy cervix is uniform in appearance under the transilluminating light. If dark streaks made by blood vessels are seen, it indicates the presence of inflammatory hyperemia.

The writer has used transillumination continuously since discovering this method of examining the cervix in 1926. He has become more and more impressed with the large amount of cervical disorders which are missed by the usual methods of examination. He has also been impressed by the inadequacy of treatment which has not been controlled by transillumination.

Experience with transillumination points the way to the rational treatment of the cervix. Cysts indicate the areas where there is buried disease, and their absence indicates the areas where treatment may be superficial.

Treatment is given shortly after a menstrual period. The writer waits until about three months after parturition, as much of the pathological condition disappears spontaneously with involution.

The writer electrocoagulates deeply where there are cysts hidden under the portio epithelium, and superficially all of the erosion area, extending the coagulation a short way into the relaxed external os. This treats the area which is most apt to produce cancer and extensively reduces the mucus-producing area. It also leaves the upper part of the canal to secrete a certain amount of mucus, which is desirable.

In the writer's opinion, if the practice of transillumination became universal, an immense amount of cervical disorders that are overlooked today, would be discovered and treated. When that day comes, if the treatment of the cervix prevents cancer, the incidence of cancer of the cervix should decline tremendously.

When man finds a dangerous spot in a road, he hangs out a red lantern. Nature has hung a red lantern in the cervix and it is the duty of the profession to look for it.

Leonard R. Thompson, M.D.

Original Articles

ADENOMA OF THE KIDNEY*

REPORT OF SIX CASES

CHARLES C. HIGGINS, M.D.
CLEVELAND, OHIO

RENAL adenomas were first accurately described by Sturm[1] in 1875. Although multiple small adenomas are not uncommon in kidneys which are the seat of vascular disease, a simple adenoma of the kidney of palpable size is seldom observed. Occasionally, pain and hematuria may occur. Because of the clinical rarity of this neoplasm a report of the following cases seems justified.

CASE REPORTS

CASE 1. A woman, aged forty-seven, was seen in the Clinic November 21, 1935, complaining of "blood in the urine for varying periods in the past year." At first she had believed the pink-staining urine to be spotting from the vagina. During the past month blood had frequently been noticed in the urine. Four months after the onset of hematuria a severe colicky pain to the right of the umbilicus had radiated to the right flank. Chills with slight fever had been present, but no nausea nor vomiting. The patient had lost and regained twenty pounds. For several weeks she had lacked energy and had had frequent attacks of pain and soreness in the right quadrant. Frequency and urgency of elimination and dysuria had been present for several years.

She had dyspnea on exertion with dependent edema of the ankles, but reported no history of precordial pain. Menopause had occurred eight years before; vaginal bleeding had lasted for one day nine months previous to the present illness.

Physical examination revealed a well developed, obese, nervous woman. The blood pressure was 160 systolic and 98 diastolic. The abdomen revealed panniculus adiposus without mass formation; there was moderate tenderness in the right upper quadrant.

Cystoscopy revealed that the bladder contained a small amount of urine, and 150 cc. of solution was introduced without distress to the patient. The bladder was negative for calculi, ulcer, tumor, or diverticulum. Both ureteral orifices were seen and catheterized without encountering obstruction. Specimens were readily obtained from both sides.

An initial roentgenogram with the catheters *in situ* was normal. Bilateral pyelograms taken after the injection of 10 cc. skiodan into each kidney were unsatisfactory because the patient changed position. An intravenous urogram showed prompt function from both kidneys. A filling defect in the middle of the pelvis of the right kidney was believed to be due to a neoplasm, probably a hypernephroma. The left kidney was normal. Another retrograde pyelogram made the following day confirmed the report of the previous day with the additional impression of a possible papilloma of the kidney pelvis.

Laboratory studies revealed the following: Red blood cell count, 4,650,000 per cu. mm.; hemoglobin, 91 per cent; white blood cell count, 5,400 per cu. mm.; neutrophils, 73 per cent; lymphocytes, 27 per cent; blood urea, 30 mg. per 100 cc.; blood sugar, 113 mg. 6 hr. postprandial; urinalysis: specific gravity, 1.070; acid reaction; albumin, 0; sugar, 0; blood Wassermann and Kahn, negative.

On December 3, 1935, a right ureteronephrectomy was performed under spinal anesthesia.

The pathologic report was as follows: The specimen weighs 183 Gm. and measures 12 by 5 by 5 cm. The consistency of the specimen is greatly reduced. On the posterior surface

* From the Cleveland Clinic, Cleveland.

just below the hilus a soft rounded elevation measures 1.5 cm. The capsule strips with ease, leaving a smooth surface. On cut section the

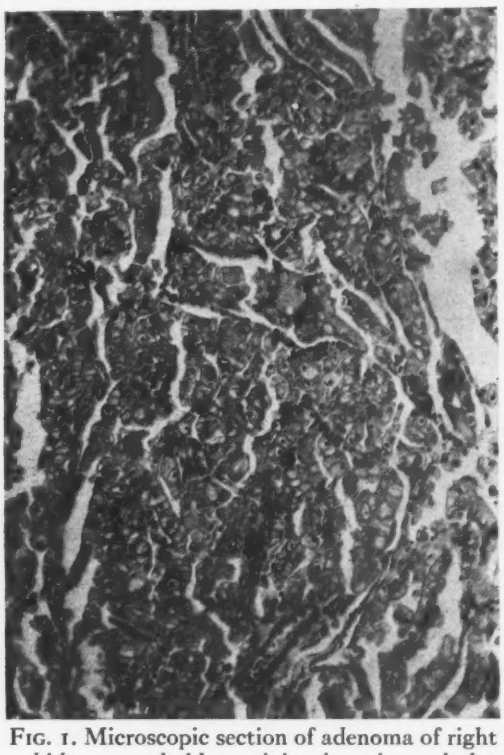

Fig. 1. Microscopic section of adenoma of right kidney probably originating in tubular epithelium.

cortex measures 0.9 cm. The markings are distinct. The pelvis of the kidney is dilated and measures 7 cm. in length and 4 cm. in the greatest circumference. Partially overlying the ureteral opening a circumscribed soft tumor mass projects into the kidney pelvis, apparently from a papilla, and is continuous with the tumorous bulging described on the external surface. The tumor within the pelvis of the kidney measures 4.2 by 3.0 by 2.0 cm. It has a comparatively smooth surface but is covered with a thin encrustation of urinary sediment. A bilobed smaller tumor mass extending at right angles from the base of this tumor measures 2.0 by 1.5 cm. and is apparently continuous with the tumor mass described on the external surface. Except for the central necrotic area it is grayish white and slightly granular in appearance. The ureter is patent and measures 19 cm. in length. There is no gross evidence of any tumor along the course of the ureter.

Microscopically (Fig. 1) along one margin section shows practically normal kidney tissue except for thickened capsule and round cell infiltration. The remainder of the section consists of a densely encapsulated tumor, composed of irregular masses of large, well defined, pale, pink-staining, somewhat vacuolated, epithelial cells having relatively small nuclei. The masses of epithelial cells are separated by a very delicate vascularized stroma. There are no dense masses of connective tissue in the tumor. The tumor cells are fairly uniform in size and type and show some tendency to polarization around the blood vessels. In the capsule of the tumor are a few atrophic glomeruli but no recognizable renal tubules. Section through the polypoid mass projecting into the pelvis shows complete loss of pelvic epithelium and considerable, finely granular, calcium deposit on the surface. The tip of the projection shows considerable diffuse hemorrhage into the tumor tissue. This section and the first are essentially the same, and in certain parts the tumor cells tend to assume a tubular arrangement. Section through the lower end of the ureter shows no abnormality.

Diagnosis: Adenoma of the right kidney probably originating in tubular epithelium. The patient had an uneventful convalescence and left the hospital on the fifteenth day following nephrectomy. The last visit to the Clinic was on January 25, 1941, at which time the patient was free of symptoms.

Case II. A machinist, forty years of age, entered the Clinic October 12, 1939, complaining of pain in the back and right side. Three years previously he had experienced very severe pain in the right subcostal area and right upper quadrant, which had required an injection of morphine for relief. The attack had lasted for two days. A diagnosis had been made of renal calculi. During the past three years he had experienced three similar attacks. The last attack four months previously had begun with severe pain in the back on the right side and again required morphine for relief; the following morning the pain had been more pronounced in the right upper quadrant. Since that time the pain had been almost constant. He had not observed blood in the urine. During the past three days the pain had been very severe.

The physical examination revealed a well developed young man. Pulse rate was 70; blood pressure 170 systolic and 114 diastolic.

A large mass was palpable in the right upper quadrant extending 3 inches below the costal

margin and to the left of the midline in the epigastrium. It was also palpable in the right flank and was firm, not tender, and not freely movable. A scar from an appendectomy in 1918 was present. The prostate was slightly enlarged on rectal examination.

Laboratory studies revealed the following: Red blood cell count, 4,930,000 per cu. mm.; hemoglobin, 91 per cent; white blood cell count, 5,900 per cu. mm.; neutrophils, 89 per cent; lymphocytes, 11 per cent; blood urea, 36 mg. per 100 cc.; blood sugar, 98 mg. per 100 cc.; urinalysis: specific gravity, 1.015; albumin, faint trace; rare white blood cell on microscopic examination; Wassermann, negative.

The initial roentgenogram showed a normal lumbosacral region. The left kidney was normal in size, shape, and position. A large mass was present in the right renal area. The intravenous urogram revealed no evidence of function of the right kidney. The left kidney appeared normal. The retrograde pyelogram showed a large hydronephrosis of the right kidney with elevation of the pelvis from a large mass occupying the lower pole of the kidney. The upper right ureter was displaced medially. The urine from this kidney revealed an occasional white blood cell; the culture was normal.

A final diagnosis was made of tumor of the right kidney, hydronephrosis, and hypertension. A right nephrectomy was performed on January 3, 1940. Convalescence was uninterrupted, and the patient was discharged from the hospital sixteen days later.

The pathologic report was as follows: The gross specimen consists of the right kidney; 1,500 cc. of bloody fluid and débris was evacuated from the cyst of the kidney. After formalin fixation and evacuation of its contents, the kidney weighs 532 Gm., measures 16.5 by 16.5 by 11.5 cm., and consists of one large cyst the shape of a flattened sphere. One solid area on the circumference appears to be kidney tissue, measures 6 by 9 cm. and is raised 3 cm. above the surrounding cyst wall. Emerging from under one margin of this area is a segment of ureter, which measures 12 cm. in length and courses over the surface of the cyst, being bound to it by adhesions.

On section the lumen of the cyst contains a small amount of granular débris and a laminated blood clot. The cyst wall measures 3 to 4 mm. in thickness; an area of compressed kidney tissue at the periphery was identified on the surface. In this compressed area are the flattened pelvis and calyx from which a probe may be passed into the ureter. The cavity of the cyst is independent of the kidney pelvis. Flattened, laminated areas of yellowish tissue in the cyst wall may be tumor.

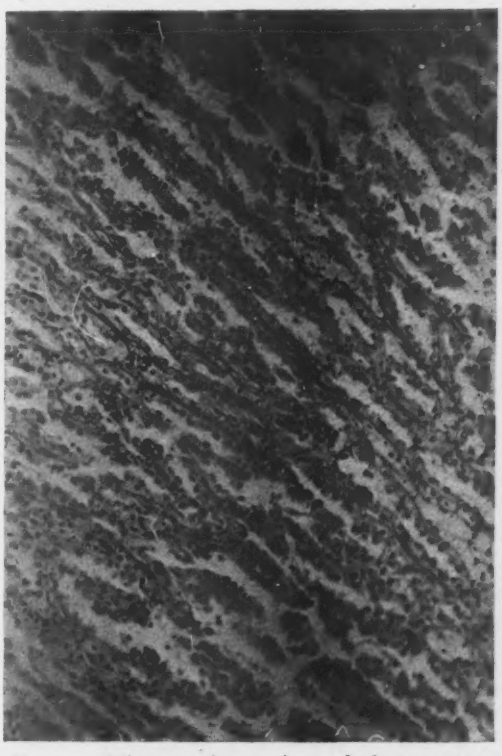

Fig. 2. Microscopic section of degenerating cystic adenoma of right kidney.

Microscopically, (Fig. 2) a section through the kidney shows rather marked atrophy, fibrosis, and a diffuse interstitial inflammatory reaction throughout the cortex and medulla. The pelvic mucosa is practically normal. The section including a portion of the cyst wall consists of atrophic fibrotic kidney tissue, and a layer of dense connective tissue. The inner surface of the cyst is lined with blood clot in which no tumor tissue is identified. A section through the thickened area of the cyst wall shows atrophic kidney tissue along one surface. Attached to the inner surface of the cyst wall is a nodule of adenomatous tumor tissue of renal origin, which is histologically benign, is well encapsulated, and does not appear to be invasive. On the inner surface of the tumor nodule are necrotic tumor tissue and blood clot. Section through the thin portion of the cyst wall shows a dense connective tissue

capsule with a layer of blood clot on the inner surface but no identifiable kidney tissue. One small area of adenomatous tissue lies on the inner surface of the blood clot.

Diagnosis: Degenerating cystic adenoma of the right kidney.

Case III. A housewife, aged forty-five, entered the Clinic, November 10, 1941, complaining of pain in the right flank radiating to the right groin. For the last ten to twelve years the patient had had "attacks of cystitis," characterized by dysuria, urgency, frequency, and pyuria usually accompanied by terminal hematuria. Relief had always been afforded by mandelic acid. The last attack had been in 1938.

Two days prior to this admission she began to feel ill generally. The only specific complaint was pain in the right flank. Her temperature fluctuated between 99°F. and 100°F. She experienced no chills nor systemic symptoms. On sulfonamide therapy her temperature returned to normal, but the malaise persisted. The day before admission the dull aching pain in the right subcostal area was more pronounced, and a hypodermic of morphine was administered for relief.

On the day of admission the pain was again quite severe, and gross blood was observed in the urine. Physical examination showed a well developed woman with a temperature of 99°F. Blood pressure was 120 systolic and 80 diastolic; pulse rate was 84. The right kidney was enlarged and tender.

Laboratory studies revealed the following: Red blood cell count, 3,900,000 per cu. mm.; hemoglobin, 71 per cent; white blood cell count, 12,700 per cu. mm.; neutrophils, 87 per cent; eosinophils, 2 per cent; lymphocytes, 11 per cent; blood urea, 45 mg. per 100 cc.; blood sugar, 102 mg. per 100 cc.; creatinine, 1.7 mg. per 100 cc.; urinalysis: specific gravity, 1.015; Ph, 6.5; albumin, 3 plus; red blood cells on microscopic examination, 3 plus; Wassermann, negative.

The initial roentgenogram showed a normal lumbosacral region and left kidney. The right kidney was not satisfactorily visualized. Bilateral pyelograms showed a normal left kidney. The right kidney was incompletely filled and showed a smooth, filling defect involving the pelvis. The lower calyx was not demonstrated, which indicated the presence of a tumor or blood clot. A right pyelogram one week later showed a filling defect of the pelvis of the kidney with apparent involvement of the inferior calyx.

A papillary tumor of the renal pelvis was suspected, and a right nephrectomy was performed December 4, 1941. The convalescence was uninterrupted, and the patient was discharged from the hospital two weeks later.

The pathologic report (Fig. 3) stated that the specimen consists of the right kidney weighing 408 Gm. The kidney is considerably distorted by a large, spherical, encapsulated mass bulging from the anterior surface, and measuring 9 cm. in diameter. On section through the kidney, the upper calyx is normal. Projecting into the pelvis is a large, dark, hemorrhagic polypoid mass, at the crest of which the mucosa has sloughed, and the area is covered with a blood clot. On section through the tumor the surface consists largely of dark hemorrhagic infarcted necrotic tissue. Around the periphery of the tumor are areas of less altered tumor, which have a mottled red, brown, gray, and yellowish appearance. The tumor appears to be entirely encapsulated except at the site of ulceration in the pelvis, and there is no apparent invasion of adjacent tissue or blood vessels. Two sections show an encapsulated tumor apparently of adenomatous type, but complicated by extensive degenerative changes with hemorrhage and necrosis and proliferation of connective tissue. In small areas a considerable amount of lipoid material is present in rather large cells, but histologic arrangement and character of the cells does not suggest hypernephroma. The tumor appears to be well confined within its capsule and is not invading kidney tissue.

Diagnosis: Degenerating adenoma of the right kidney.

On November 20, 1942, approximately one year after operation the patient was free of symptoms.

Case IV. A housewife, aged forty, entered the Clinic, February 18, 1933, complaining of weakness and a mass in the left side. Since the birth of a child eighteen months before, the patient had noticed dizziness and weakness. A few days after delivery, she had experienced pain in the left upper quadrant, which had entirely subsided. Before delivery the blood pressure had been stated to be 200 systolic and 105 diastolic but recently had been normal. Constipation had been present for one month, and she had been aware of a mass in the left upper quadrant.

Physical examination revealed an obese woman, apparently in good physical condition. Temperature was 99.4°F. There was a 1 plus

Fig. 3. Microscopic section of degenerating adenoma of right kidney.

enlargement of the thyroid with a small adenoma in the left lobe. Blood pressure was 114 systolic and 75 diastolic. Pulse rate was 90. A large tumor was palpable in the left upper quadrant and was irregular, firm, and not freely movable. The mass extended into the left flank and was not tender.

Laboratory studies revealed the following: Red blood cell count, 4,400,000 per cu. mm.; hemoglobin, 84 per cent; white blood cell count, 12,200 per cu. mm.; neutrophils, 82 per cent; lymphocytes, 17 per cent; mononuclears, 1 per cent; blood sugar, 82 mg. per 100 cc.; blood urea, 30 mg. per 100 cc.; urinalysis: specific gravity, 1.025; albumin, faint trace; red blood cells, 2 plus; occasional white blood cell; Wassermann, negative.

The following reports were sent by the referring physician:

The colon filled with difficulty owing to spasticity of the bowel. One point is noticeably narrowed probably from pressure near the splenic flexure. An area just proximal to the splenic flexure is compressed. The bowel beyond this point appears normal. The coils of the intestines seem to move over the anterior surface of the mass. The splenic flexure is not depressed.

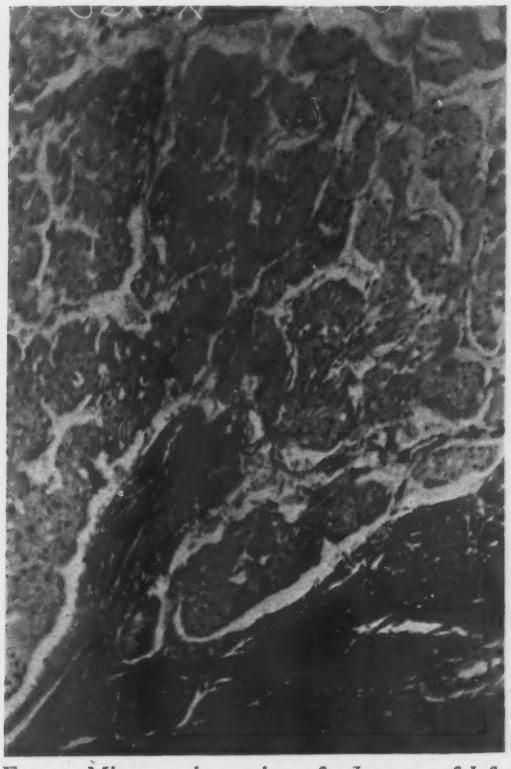

Fig. 4. Microscopic section of adenoma of left kidney.

The intravenous urogram shows the right kidney to be normal. There is marked impairment of function of the left kidney which is poorly visualized.

The retrograde pyelogram shows the left kidney to be depressed. The kidney pelvis and the lower major calyx and calyces are well visualized. The medial and upper calyces are not well outlined.

Diagnoses: (1) Tumor of left kidney; (2) adenoma of thyroid.

A left nephrectomy was performed February 23, 1933. Convalescence was uneventful, and the patient was discharged from the hospital fifteen days later.

The pathologic report was as follows: Specimen consists of left kidney weighing 1,115 Gm. It is greatly enlarged and distorted by a well encapsulated, nodular, globular tumor mass which has replaced the upper half of the kidney. The tumor mass measures approximately 14 cm. in diameter. On cut section the tumor is made up of varying sized lobules of pale yellowish, extremely soft and pliable, cellular

tissue, which bulges on the cut surface. These lobules surround a large central area of yellowing, caseous tissue in which there are several areas of hyaline scarring. This area on cut section measures 9 by 5 cm. The tumor appears to arise from the hilar portion of the upper pole. The portion of the normal kidney remaining measures 11 by 6 by 6 cm. On cut section this portion of the kidney shows well demarcated anatomic markings and appears grossly normal. The pelvis and 5 cm. of the ureter appear normal.

Microscopically, (Fig. 4) the section of the kidney shows much fibrous tissue sclerosis of a few glomeruli, a few small scars, and localized areas of lymphoid infiltration. Other sections show an encapsulated tumor composed of solid masses and cords of large vacuolated cells having clearly defined cell borders, large quantities of cytoplasm and relatively small, deep-staining nuclei without mitotic figures. The cell masses have no central lumina. There is no papillary growth, no palisading of cells around blood vessels. In some sections are large areas of ischemic necrosis. Sections stained with scarlet red show no fat in the tumor cells.

Diagnosis: Adenoma of left kidney.

On October 15, 1943, approximately ten years later, the patient was living, well, and free of symptoms.

Case v. A machinist, aged twenty-nine, entered the Clinic, August 18, 1942, complaining of blood in the urine. On January 1, 1942, he had observed bright red blood in the urine. The bleeding had continued for one week and then had subsided. It had recurred intermittently since that time and was becoming more pronounced. One month previously he had experienced a severe attack of pain in the right flank. The pain had radiated toward the groin and right testicle. In the past month he had experienced five such attacks lasting up to twelve hours. After the pain had subsided, the urine again had become clear.

The physical examination revealed a well developed man twenty-nine years of age. A large mass was palpable just below the costal margin in the right kidney region, extending posteriorly into the flank. It was smooth, movable, and slightly tender to deep palpation.

Laboratory studies revealed the following: Red blood cell count, 4,400,000 per cu. mm.; hemoglobin, 84 per cent; white blood cell count, 7900 per cu. mm.; neutrophils, 50 per cent; eosinophils, 2 per cent; lymphocytes, 43 per cent; monocytes, 5 per cent; blood sugar, 84 mg. per 100 cc.; blood urea, 30 mg. per 100 cc.; urinalysis: specific gravity, 1.024; Ph. 6; albumin, plus; sugar, 0; microscopic, many red blood cells, occasional white blood cell.

The initial roentgenogram showed a normal lumbosacral region. The left kidney was normal in size, shape, and position. In the right renal area was a large mass of regular outline. A retrograde pyelogram revealed hydronephrosis of the right kidney. There was a deformity of the caudal calyx and a large mass in the lower pole of the right kidney.

Diagnosis: Tumor of the right kidney.

A right nephrectomy was performed August 20, 1942.

Convalescence was uneventful, and the patient was discharged from the hospital fifteen days later.

The pathologic report was as follows: The right kidney weighs 607 Gm. A thin capsule strips with ease from the entire surface and reveals in the upper half of the kidney normal parenchyma, which is smooth and pale. The lower half of the kidney shows a smooth surface but no normal parenchyma. Just beneath the surface are numerous dilated veins. There are three small nodules on the anterior surface of the lower pole. (Fig. 5.)*

On the posterior surface near the hilum are scattered areas of black pigment. On longitudinal section the kidney shows a well encapsulated tumor mass measuring 11 cm. in the greatest diameter. In the center is a small area of necrosis 1.5 cm. in diameter. About this area is thickened, fibrous tissue which at one point in the wall contains a deposit of calcium. The tissue appears edematous but shows no areas of cystic degeneration adjacent to the tumor capsule. There is a thin layer of compressed kidney tissue, otherwise the tumor occupies the entire lower half of the kidney. The pelvis of the kidney is moderately dilated.

Microscopically the section shows an encapsulated tumor of uniform type composed of masses of large cells with considerable vacuolated and granular cytoplasm with finely divided lipoidal material in many tumor cells. The masses of turm ocells are separated by

* The three small nodules on the anterior surface of the lower pole in the gross description are knobby protuberances of the intrarenal tumor beneath the capsule of the tumor and are not secondary or metastatic nodules.

capillaries. There is very little degenerative change. The histologic picture is practically identical with that of some cortical adenomas

Fig. 5. Gross specimen of adrenal cortical adenoma of right kidney.

found in the adrenal gland. I do not believe this is the usual type of hypernephroma frequently encountered in the kidney.

Diagnosis: Adrenal cortical adenoma of the right kidney.

When last seen on December 4, 1942, the patient was free of symptoms.

Case VI. A woman, forty-four years of age, entered the Clinic on April 10, 1943, complaining of a constant dull pain in the right kidney region and of high blood pressure of four years' duration. For four months she had complained of a constant dull ache in the right kidney region, and her referring doctor had palpated a large mass in this area. No other urinary symptoms were evident.

Physical examination revealed a well developed and well nourished woman. The blood pressure was 196 systolic and 115 diastolic. Pulse rate was 81. A large mass the size of a grapefruit was present in the right renal area. It was smooth, movable and not tender.

Laboratory studies revealed the following: Red blood cell count, 4,280,000 per cu. mm.; hemoglobin, 80 per cent; white blood cell count, 11,100 per cu. mm.; blood sugar, 88 mg. per 100 cc.; blood urea, 33 mg. per 100 cc.; urinalysis: specific gravity, 1.025; albumin, faint trace; sugar, 0; few red blood cells; rare white blood cell; Wassermann, negative.

The initial roentgenogram showed a normal left kidney. There was a large tumor at the lower pole of the right kidney.

Diagnosis: Solitary cyst at lower pole of the right kidney.

A right nephrectomy was performed on

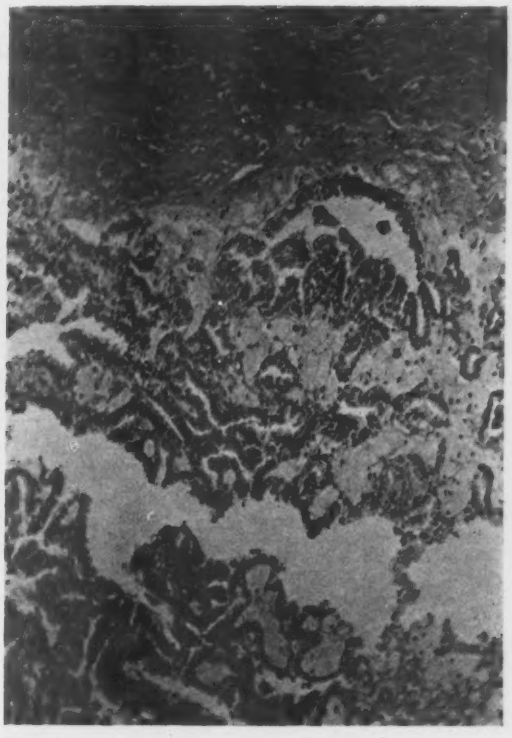

Fig. 6. Microscopic section of degenerating cystic adenoma of kidney.

April 12, 1943. The patient was discharged from the hospital sixteen days later.

The pathologic report was as follows: The specimen consists of the right kidney weighing 325 Gm. At the lower pole is a large encapsulated, cystic tumor mass about 3 cm. in diameter which on section is found to be filled with thick, flaky, grumous fluid, rich in cholesterin crystals with a large amount of necrotic tissue covering the inner lining of the cystic tumor. There is little or no identifiable, undegenerated solid tumor. There are no other tumors in the kidney. The pelvis and calices are slightly dilated, but the pelvic membrane and the short segment of ureter are grossly normal. Near the upper pole of the kidney is a small amount of arteriosclerotic scarring.

Microscopically, (Fig. 6) the sections show a well encapsulated type of growth with extensive degenerative changes and no definite histologic evidence of malignancy or gross or microscopic evidence of malignancy as indicated by local invasion of capsule, kidney tissue, or blood vessels. The histologic characteristics of the tumor, apart from the degenera-

tive changes, suggests its origin from renal tubules, and it is similar in general type to the small cortical adenomas so frequently occurring in arteriosclerotic kidneys.

Diagnosis: Degenerating cystic adenoma of the kidney.

REVIEW OF THE LITERATURE

In 1927, Judd and Simon[2] cited seven cases from the literature and added an additional case. In 1929, in a similar review Kretschmer and Doehring[3] added a case to bring the total to seventeen. Table 1 presented by Carver[4] included the cases up to 1935 but omitted that reported in 1931 by Creevy.[5] The total to date, therefore, including the six cases herein reported is twenty-nine. As two cases previously reported were found accidentally at postmortem examination, only twenty-seven cases of benign adenoma of the kidney have been treated surgically.

Age. The age incidence is very inconstant as well as inconspicuous in the range; the youngest patient on record was an eleven month old girl (Czerny).[6] Kynoch[7] reported an adenoma of the kidney in a child sixteen months of age. The oldest patient was a man seventy years of age (Binney).[8]

Sex. Benign adenoma of the kidney occurs with almost equal frequency in both sexes. In the cases in which the sex was indicated, thirteen occurred in women and eight in men. Four of our patients were women and two men.

Clinical Data. As stated by Kretschmer,[3] the majority of cases were reported before patients were carefully studied by roentgen ray, cystoscopy, ureteral catheterization, and pyelography. Likewise, in those cases observed at postmortem examination clinical data were not available.

The one constant symptom was the presence of an abdominal tumor. In the cases cited by Carver[4] a tumor was present in nineteen of twenty-two cases. A tumor was not palpable in the case cited by Creevy.[5] The tumor was palpable in five of our six cases; in four on the right, and in one on the left.

Pain. Of the twenty-two cases collected by Carver[4] pain was a symptom in eleven. Creevy's[5] patient also complained of pain in the left renal area. All of our six patients experienced pain. The pain varied from a dull aching pain to severe attacks of colic associated with hematuria and the passage of clots requiring morphine for relief.

Hematuria. In the twenty-two cases collected by Carver[4] hematuria was present in eight instances. Hematuria was present in five of our six cases and in that cited by Creevy.[5] The blood may be discernible only on microscopic examination of the urine, or the patient may observe gross hematuria and the presence of clots in the voided urine.

Before the introduction of pyelography the diagnosis was established by exploratory operation; now the diagnosis of a renal tumor may be made by retrograde pyelography. In all six cases in this series a definite filling defect was demonstrable on the pyelogram. Likewise, in the case observed by Creevy[5] a filling defect was evident. In the twenty-two cases cited by Carver[4] a filling defect was demonstrated in the pyelogram in four instances.

Size. Adenomas vary from a millimeter in diameter to over 20 cm. in diameter. (Table 1.) Large tumors are usually noted in patients past middle life. However, Czerny,[6] Kynoch,[7] Morris,[9,10] and Schonbron[11] reported palpable tumors in children under three years of age.

The histogenesis of these tumors is not clear. At postmortem study arteriosclerotic kidneys are frequently found to be the seat of multiple adenomas. Ewing[12] has stated that the papillary cystadenomas frequently observed in arteriosclerotic kidneys are secondary to vascular occlusion. The frequent association of adenomas and arteriosclerosis of the kidneys has been mentioned by Kaufmann,[13] Metzner,[14] and Sabourin.[15] Turley and Steel[16] have sought to trace the origin of adenomas to the

TABLE I

ADENOMA OF KIDNEY—LIST OF PUBLISHED CASES

No.	Author	Sex	Age	Side	Pain	Hematuria	Tumor	Urine	Pyelogram	Operation	Diagnosis	Result	Remarks
1	Albert	F	42	R	+	+	+	B & P	.....	Nephrectomy	Papillary adenoma	Recovered	
2	Bell	F	39	R	..	..	+	.....	.....	Nephrectomy	Alveolar	Died—16 hours	13 by 10 by 7.5 cm. 650 Gm. in weight
3	Binney	M	70	L	+	..	+	Neg.	.....	Nephrectomy	Adenoma	Recovered	
4	Czerny	F	13 1/12	L	..	+	+	.....	.....	Nephrectomy	Adenoma	Died—2 days	Peritonitis
5	Foules and Braasch	M	48	L	..	+	+	.....	.....	Nephrectomy	Adenoma	Recovered	12 cm. in diameter
6	Judd	F	51	R	+	+	+	.....	Filling defect	Nephrectomy	Adenoma	Recovered	13 by 11 by 5 cm.
7	Keyes	M	49	R	..	+	+	.....	.....	Nephrectomy	Alveolo papillary adenoma	Recovered	Nodular growth
8	Kretschmer	F	24	R	..	..	+	R.B.S.C.	Dislocation of pelvis and filling defect	Resection	Adenoma	Recovered	Diminished renal function on that side
9	Kynoch	..	19 1/12	R	..	..	+	.....	.....	Nephrectomy	Adenoma	Recovered	5 by 5 by 6.5 cm. Posterior part of kidney: size of lemon
10	Morris	M	48	R	+	+	+	.....	.....	Nephrectomy	Adenoma	Recovered	Anterior surface: lobulated and encapsulated
11	Morris	F	35	R	+	+	+	.....	.....	Nephrectomy	Adenoma	Recovered	
12	Morris	F	46	..	+	..	+	.....	.....	Anterior nephrectomy	Tubular	Recovered	Size of cocoanut
13	Morris	M	55	..	..	..	..	.....	.....	.....	.....	.....	Autopsy specimen—no data
14	Morris	F	3	..	..	..	+	.....	.....	Nephrectomy	Adenoma		
15	Norman	M	53	..	..	..	..	.....	.....	.....	Alveolar	.....	Autopsy specimen—no data
16	Schonbron	..	2	..	..	..	+	.....	.....	.....	Adenoma	Recovered	
17	Weir	M	35	L	+	+	+	.....	.....	Transperitoneal nephrectomy	Adenoma	Recovered	
18	Faucett	M	..	L	+	..	+	.....	Filling defect	Nephrectomy	Congenital cystic adenoma	Recovered	
19	Gordon-Taylor	F	20	L	+	..	+	.....	.....	Nephrectomy	Adenoma fibroma	Recovered	13 by 11 by 5 in. 22 lb. in weight
20	Cabot	F	45	R	+	..	+	.....	Filling defect	Anterior nephrectomy	Cystic adenoma	Recovered	20 cm. in diameter
21	Garceau	F	54	L	+	..	..	.....	.....	Nephrectomy	Papillary cystic	Died	Size of fetal head
22	Nitch	F	56	L	..	..	+	.....	.....	Resection	Papillary adenoma	Recovered	Big hemorrhages in several places containing large particles of iron
23	Creevy	F	24	L	+	+	..	R.B.C.	Filling defect	Nephrectomy	Adenoma	Recovered	Tumor 3 cm. in diameter
24	Higgins	F	47	R	+	+	..	R.B.B.	Filling defect	Nephrectomy	Tubular adenoma	Recovered	Tumor 4.2 by 3 by 2 cm.
25	Higgins	M	40	R	+	..	+	.....	Filling defect	Nephrectomy	Cystic adenoma	Recovered	16.5 by 16.5 by 11.5 cm.
26	Higgins	F	45	R	+	+	+	R.B.C.	Filling defect	Nephrectomy	Adenoma	Recovered	408 Gm.
27	Higgins	F	40	L	+	+	+	R.B.C.	Filling defect	Nephrectomy	Adenoma	Recovered	1,115 Gm. 14 cm. in diameter
28	Higgins	M	21	R	+	+	+	R.B.C.	Filling defect	Nephrectomy	Adenoma—cystic	Recovered	11 cm. in diameter
29	Higgins	F	44	R	+	+	+	R.B.C.	Filling defect	Nephrectomy	Cystic adenoma	Recovered	8 cm. in diameter

glomeruli. Albarron,[17] however, stated that the precursors of adenomas were islands of imperfectly developed and displaced tubules, originating in some aberration of fusion and observed in many kidneys.

The tumors may be divided into three groups: (1) tubular, (2) alveolar and (3) papillary.

The tumors vary in size from a millet seed to those weighing over 1,000 Gm. They are well encapsulated, grayish red in color, or vary from gray to yellow. The tumor is usually situated in the cortex of the kidney but may be found in the medullary portion. The lesions may be either single or multiple.

Tubular adenomas are not uncommon and consist of long, irregular canals lined with small, fat-free cells with large nuclei. The stroma contains numerous blood vessels. Trinkle[18] mentions four such cases, and this type of adenoma has been described by Ricker,[19] Norman,[20] and others.

The alveolar type, microscopically, reveals polyhedral cells arranged in alveolar fashion. Many of the alveolar spaces are filled with these large cells. The cells frequently contain fat droplets. Microscopically, certain hypernephromas closely resemble alveolar adenomas.

The papillary type seems to develop in a cyst by proliferation of the lining epithelium. Trinkle[18] states that a papillary cyst adenoma is of the solid type when the papillary processes so fill the cyst cavity that no appreciable space remains.

Microscopically, the connective tissue papillae are covered with a layer of cylindrical or cuboidal epithelium, the cells of which may be opaque, small, and granular, or large and clear with granules of doubly refractive lipoid. This is probably the most common type.

The possible relationship between adenomas of the kidney (benign or malignant) and carcinoma (hypernephroma) is an interesting problem. In 1883, Grawitz[21] advanced the theory that hypernephroma of the kidney developed from adrenal rests. This theory was accepted for many years, and although still believed to be the most plausible explanation by some investigators is subject to discussion.

Sudeck,[22] in 1893, disputed the theory propounded by Grawitz[21] and suggested that the Grawitz tumor (hypernephroma) arose from pre-existing adenomas. He strongly emphasized the similarity of the cells in the two types of tumors. Stoerk[23] concurred with Sudeck[22] stating that hypernephromas arose from adenomas of sclerotic kidneys. They stressed (1) the cyst formation associated with arteriosclerotic contracted kidneys followed later by (2) the formation of cyst adenomas and finally hypernephroma.

Creevy[5] cited an adenoma of the kidney presenting a structure similar to hypernephroma, which was also observed in one case in our series. Creevy in discussing the gross and microscopic appearance of the tumor stated:

"The histologic structure corresponds exactly to that of typical hypernephroma or carcinoma of the cortex except that the individual cells are wholly 'benign' in appearance. That is, the nuclei are small; nucleoli are lacking; there are no mitotic figures; the cell margins are distinct; their arrangement is orderly." He concluded, "Nevertheless, one cannot avoid the suspicion that, left to itself, this tumor would in time have developed into a typical malignant epithelial neoplasm of the kidney."[5]

Nicholson,[24] in 1909, reported a case in which a tumor of the kidney removed surgically was diagnosed histologically "carcinoma of the kidney." Six months later a recurrence developed in the operative scar. Microscopic study of the tissue removed at postmortem examination revealed a papillary adenoma. In 1910, Nobiling[25] cited a case in which one kidney was the site of miliary adenomas, while the opposite kidney contained a hypernephroma.

Gray,[26] in 1927, cited a case of kidney tumor found at necropsy in which some areas had the appearance of hypernephroma, in other areas the structures re-

sembled papillary adenomas, while in other areas the cells and their arrangement resembled both tumors. These areas merged imperceptibly with one another.

An unusual type of tumor, which I believe is infrequently encountered, was present in one of our cases. The pathologic report is as follows: *Microscopic:* Section shows an encapsulated tumor of uniform type composed of masses of large cells with considerable vacuolated and granular cytoplasm with considerable finely divided lipoidal material in many of the tumor cells. The masses of tumor are separated by capillaries. There is very little degenerative change. The histologic picture is practically identical with that of some cortical adenomas found in the adrenal gland. Trinkle states, "Presumptive evidence for the origin of hypernephroma from adenomas lies in the fact that very early hypernephromas are seldom found."[18] He had no examples measuring less than 1.5 cm. in diameter. Thus smaller tumors may have the gross appearance of a hypernephroma but belong to the adenoma group. However, the border line between the two groups is arbitrary.

A review of the literature indicates that the age incidence of adenomas and hypernephromas is quite similar, and that both occur with increasing frequency with advancing age.

As has been mentioned previously, adenomas arise in kidneys which are the seat of vascular disease being most frequently observed in arteriosclerotic kidneys. On microscopic examination some of the large tumors of the papillary type reveal areas very closely resembling hypernephromas of the kidney. The gross appearance and the site of the tumor may be of an adenoma, while the histologic character may be indistinguishable from that of a hypernephroma. Such observations suggest a close relationship between carcinoma of the kidney and adenoma.

Treatment. Large adenomas of the kidney should be removed surgically. In the cases reported in the literature nephrectomy was performed in twenty-four instances and resection in two. The transperitoneal approach was utilized in three cases, and the lumbar incision was employed in the remainder. In some instances a resection may be justified, but the possibility of malignant changes in some part of the tumor should be considered when employing such a procedure.

Mortality. In all six cases in this series convalescence was uneventful, and the patient was discharged from the hospital on an average of fifteen days following operation. In the literature three of twenty-one patients died following nephrectomy. The two patients in whom resection was employed recovered.

CONCLUSIONS

1. Six additional cases of large benign adenomas of the kidney removed surgically are reported.

2. A collected series of twenty-nine large adenomas of the kidney with surgical intervention in twenty-six instances is reviewed.

3. As papillary adenomas of the kidney enlarge, structural changes may occur producing a tumor histologically similar to hypernephroma of the kidney.

4. From available data and histologic study it may be assumed that some malignant epithelial tumors of the kidney develop from papillary adenomas.

5. Large adenomas of the kidney producing symptoms and requiring surgical removal are rare renal tumors.

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In chronic prostatitis there is no residual urine; cystoscopy shows no intravesical projection of the gland and urine analysis determines the nature of the infection.

PILONIDAL CYSTS

SUBCUTANEOUS EXCISION BENEATH DEFINITELY PLACED FLAPS

GEORGE L. CARRINGTON, M.D.
Surgeon to Alamance General Hospital
BURLINGTON, NORTH CAROLINA

THE purpose of this paper is to present what in our hands has been a distinct improvement over our previous method of treating pilonidal cysts. Most of the cysts are infected. We have recently applied to them a type of procedure similar to that used in the treatment of carbuncles of the neck. We have excised them beneath raised skin flaps. This method provides the advantages of an open wound without the disadvantage of slow closure by granulation alone. By placing the incisions in such a manner as to have the bases of two flaps at right angles to the long axis of the body a strong scar is obtained with little probability of future disruption.

FIG. 1. Operation done May 8, 1943; wound healed June 12, 1943; photographed, June 14, 1943.

A crucial incision is usually sufficient. In one very large cyst with skin necrosis over an abscess two and a half inches from the sinus opening in the skin, five flaps were necessary in order to excise the entire tract without having a linear mid-line scar. The mid-line scar is avoided for two reasons: In the first place healing is slow because of deficiency of soft tissues and circulation. In the second place, such a scar, especially in women with fleshy, mobile buttocks, may disrupt six or eight months after complete healing if subjected to such strains as bicycling or horseback riding.

FIG. 2. Operation done June 1, 1943; wound healed and photographed June 24, 1943.

Previously we had tried various methods. Some wounds were closed after excision of the cysts but the percentage of primary union was small. They usually had too much infection for primary closure. Most were excised and left open but the period of healing was too long. In that group during twenty years there has been only one failure to cure at the first operation. That failure appeared to be due to a second cyst not connected with the original and it was later excised. Linear, transverse, oblique and additional relaxing incisions have all been used without satisfaction. In one case of excision through a mid-line incision the wound disrupted from bicycling almost a year after complete healing. Skin flaps were then grafted across the wound to strengthen it.

Dissection of carbuncles beneath raised skin flaps has been used many years with satisfaction. The thought occurred to us

Fig. 3. Operation done June 4, 1943; wound healed and photographed July 7, 1943.

that a similar method could be used for infected pilonidal cysts. We tried it and found that it worked well.

Technically, we have modified our ideas as we have had more experience with these cysts. Formerly we injected them with a small amount of methylene blue and peroxide, believing that in this way we could better identify tissue for excision. Latterly it has appeared a mistake. The tissues are probably better identified unstained. In the making of the skin flaps care should be exercised to avoid incisions in the mid-line or long axis of the body. Healing is slow in the mid-line and disruption more liable to occur. Frosting the wound with sulfanilamide powder is useful —frosting, not caking or packing. The skin flaps can often be sutured together and to the bottom of the wound to advantage. A loose purse-string suture at the apex of the flaps, arranged so as to leave only about a quarter inch opening will sometimes prevent retraction and still allow adequate drainage. Pressure on the wound is useful when it is healing cleanly.

If the purpose of the operation is kept in mind, its variations to suit different circumstances become readily apparent. It is designed first, to obtain the safety and sureness of open wound healing; second, to reduce the length of time required in such healing by utilizing all healthy tissue available; and third, to provide a strongly healed wound without the disadvantage of a mid-line scar. (Figs. 1 to 3.)

RECONSTRUCTIVE SURGERY OF THE NOSE IN CONGENITAL DEFORMITY, INJURY AND DISEASE*

EDWARD S. LAMONT, M.D.
Attending Plastic and Reconstructive Surgeon, Cedars of Lebanon Hospital
HOLLYWOOD, CALIFORNIA

FROM Tagliacozzi[35] to Joseph,[15] reconstruction of the nose has interested the plastic surgeon more than any other aspect of the specialty. Updegraff[36] in his classic paper, "The Fall and Rise of Plastic Surgery," indelibly outlined the historical trend. Since the turn of the century, Blair,[2] Gillies,[11] Webster,[38] Sheehan,[28] Brown,[4–7] Smith,[30] Davis,[10] Straith,[33] Pierce[24] and many others have correlated and advanced the knowledge. Whether the deformity be due to trauma, loss of tissue, congenital defects, hare-lip or paraffinoma, a thorough knowledge of anatomy and physiology is presupposed for an understanding and judgment of the required reconstructive surgery.

ANATOMY

The nose is a triangular pyramid with the bridge formed by the two nasal bones and the nasal process of the maxillary bone. The former articulate with each other mesially, with the nasal process of the maxillary bone laterally and with the frontal bone cephalically. Adjoining, below the nasal bones, are the two triangular shaped upper lateral cartilages. The upper part of each anterior border is fused with its fellow of the opposite side and with the anterior edges of the septal cartilage of the nose; but the lower part is separated by a narrow interval between which the septal cartilage is seen. The posterior border is adjacent to the nasal bones and the ascending frontal process of the maxilla. The lower border is attached by fibrous tissue to the lower lateral cartilage.

The lower lateral cartilages are folded around the anterior aspect of the nose forming an arch of the nostril on either side, and with its fellow aids the septum in forming the point of the nose. (Fig. 4.) Its medial crus thus lies below the septum, its lateral portion lies somewhat parallel and is larger and oval in shape, it reaches neither down to the nostril nor backward to the maxilla. The area behind is filled with fatty fibrous tissue in which there are two or three islets of cartilage, named the small cartilages of the ala.

The bridge of the nose is supported by the nasal septum whose chief constituents are the vomer, below and behind, the perpendicular plate of the ethmoid, above and behind, the septal cartilage below and in front. Small portions of other bones take part in its construction. The septal cartilage fills the gap between the vomer and the ethmoid bones and extends forward forming part of the tip of the nose. Above and posterior, it is in juxtaposition with the anterior border of the perpendicular plate of the ethmoid while below and posterior it fits into the groove in the anterior border of the vomer and the nasal crest of the maxilla. Above and anterior, it is in contact with the suture between the two nasal bones, while immediately below it is continuous with the upper lateral cartilages of the nose.

Arterial, Venous and Lymphatic Supply. The external maxillary artery supplies the

* From the Division of Reconstructive Plastic Surgery, Cedars of Lebanon Hospital, Hollywood, and dedicated to its former Chief, the late Dr. Howard L. Updegraff. Presented in conjunction with colored surgical motion pictures at the Los Angeles County Medical Society, April 8, 1943; the Long Beach County Medical Section November 10, 1943; (by invitation) the U.S. Naval Hospital, Yosemite, California January 2, 1944; the Santa Barbara County Medical Society May 8, 1944.

superior labial and external nasal branches. The ophthalmic artery from the internal carotid sends the infratrochlear, supratrochlear and supraorbital branches.

FIG. 1. Old fracture of the nose in conjunction with a congenital deformity. A, before: front view showing the wide bridge, flattened upper lateral cartilages and depression over the septum, with a wide dropped tip; B, before: profile showing the hump, depression and dropped tip; C and D, after rhinoplasty; E, cast taken before surgery for study.

Supplying the septum proper are the anterior and posterior ethmoid arteries from the ophthalmic artery, and the lateral septal branches of the sphenopalatine artery given off by the internal maxillary artery. An anastomosis between the anterior ethmoid artery, the sphenopalatine artery and the superior labial artery forms Kiesselbach's plexus, which often hemorrhages.

The venous drainage externally is into the anterior facial vein, which joins the

internal jugular vein in the neck, and continues with the angular vein joining the superior ophthalmic vein, a tributary of the cavernous sinus of the skull. Within the nose, the blood drains superiorly into the ethmoid veins, anteriorly into the facial veins and posteriorly into the sphenopalatine veins.

The lymphatics drain externally into the anterior auricular and submaxillary lymph glands, and further to the upper deep cervical chain of lymph glands along the carotid sheath. Within the nasal cavity the lymphatic drainage is backward into the retropharyngeal lymph glands which in turn drain into the deep cervical lymph gland chain.

Nerves. The external sensory nerve supply is derived from the trigeminal nerve, through the ophthalmic division ending in the infratrochlear nerve, and the external branch of the nasociliary nerve, also from the maxillary division ending in the infraorbital nerve.

Internally, supplying the septum are the olfactory nerves for the sense of smell. The following nerves supply common sensation: the sphenopalatine nerve from the ganglion, posteriorly; septal branches of the anterior ethmoid nerve from the ophthalmic division of the trigeminal, anteriorly; and the anterior palatine nerve, from the ganglion, coming down the pterygopalatine canal, crossing along the hard palate and entering through the foramen of Scarpa in the anterior aspect of the hard palate. The lateral nasal wall derives its supply from the sphenopalatine ganglion which sends the posterior and superior lateral branches of the anterior palatine nerve, while anteriorly it is supplied by the anterior ethmoid nerve from the ophthalmic division of the trigeminal nerve. The vestibule of the nose is supplied by the alveolar branch from the infraorbital nerve, derived from the maxillary division of the trigeminal.

PHYSIOLOGY

Function. The air pressure in the nasal cavity and the sinuses is the same and varies from −6 to +4 mm. of water. Thus Proetz[25] has demonstrated that mechanical blockage at the nares, along the nasal passage or at the choana will upset the pressure and subsequently the function.

Fig. 1e. For descriptive legend see opposite page.

The air is heated to 34 degrees in its passage through the nasal chambers. It is further moistened and the nasal cavity expends one liter of water daily in performing this duty, which takes 70,000 calories. The nose acts as a filter, catching larger particles on the vibrissae, bacteria and small elements in the sticky mucous secretion. Proetz[25] has demonstrated the principle of impingement and has shown that spurs, a deviated septum and growths such as polyps will act as barriers to the normal passage of foreign material back to the nasopharynx and thence to the stomach to be destroyed by the gastric juices.

Patients, as a rule, do not complain of anosmia until smell is completely gone. Physiological upsets such as occur in

allergy have been shown by Hansel[13] to be the cause of temporary anosmia. Protracted infection in the nose which may be due to septal blockage such as that following an injury may upset the entire normal physiology.

The sinuses must be considered part of the nasal vault and act as insulators from cold against the orbit and pituitary, resonators for voice, etc. The air within these sinuses takes many hours to change and in the maxillary sinus, for instance, where there are few glands, the mucosa cannot stand a sudden influx of air.

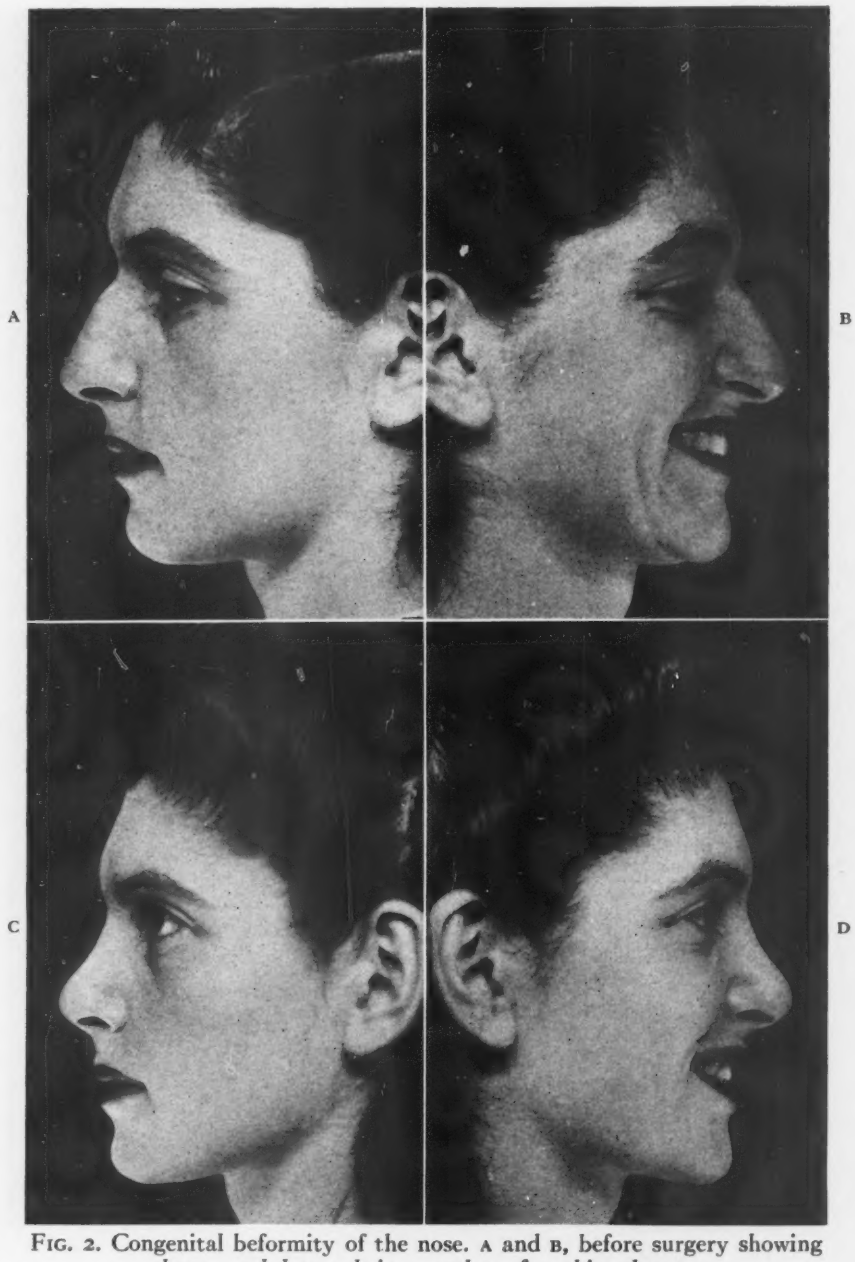
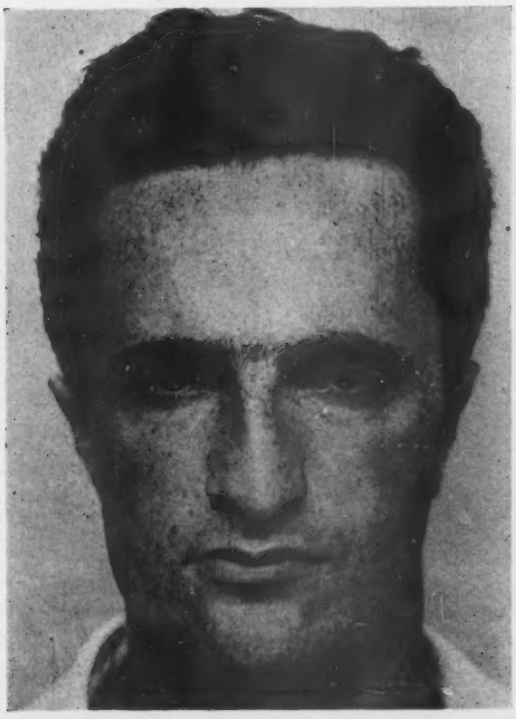


Fig. 2. Congenital beformity of the nose. A and B, before surgery showing hump and dropped tip; C and D, after rhinoplasty.

Mucous Membrane and the Cilia. Commencing at the mucocutaneous junction at the vestibule, the tissue changes from stratified squamous to ciliated columnar epithelium. The cilia are in continuous movement, and are covered with a rather sticky, pliable mucus secretion which acts to catch and hold foreign particles of bac-



A

B C

FIG. 3. Old fracture associated with a congenital deformity. To relieve blockage a thorough submucous resection was done at the time the nose was reconstructed. A and B, before surgery, demonstrating the flattened, twisted nose with a dropped tip and disappearing columella; C, after rhinoplasty.

teria. This mucous blanket covering the cilia is made up of 95 per cent water, 4 per cent mucin, 1 per cent salts, and any change in the mucin content will change the efficiency of the cilia, while drying will slow or stop the ciliary action. It is this barrier, plus phagocytosis, local tissue immunity and natural drainage which are important in the struggle against disease.

The cilia are some 7 micra long and 1 micra thick, and occur within the nose, the nasopharynx and the larynx. They are ancient structures and consequently appear early in the embryo, and incidentally their activity continues for sometime after death. Specimens from a radical operation show movements of the cilia. The movement of the cilia is upward from the lungs to the pharynx and downward from the nose to the pharynx.

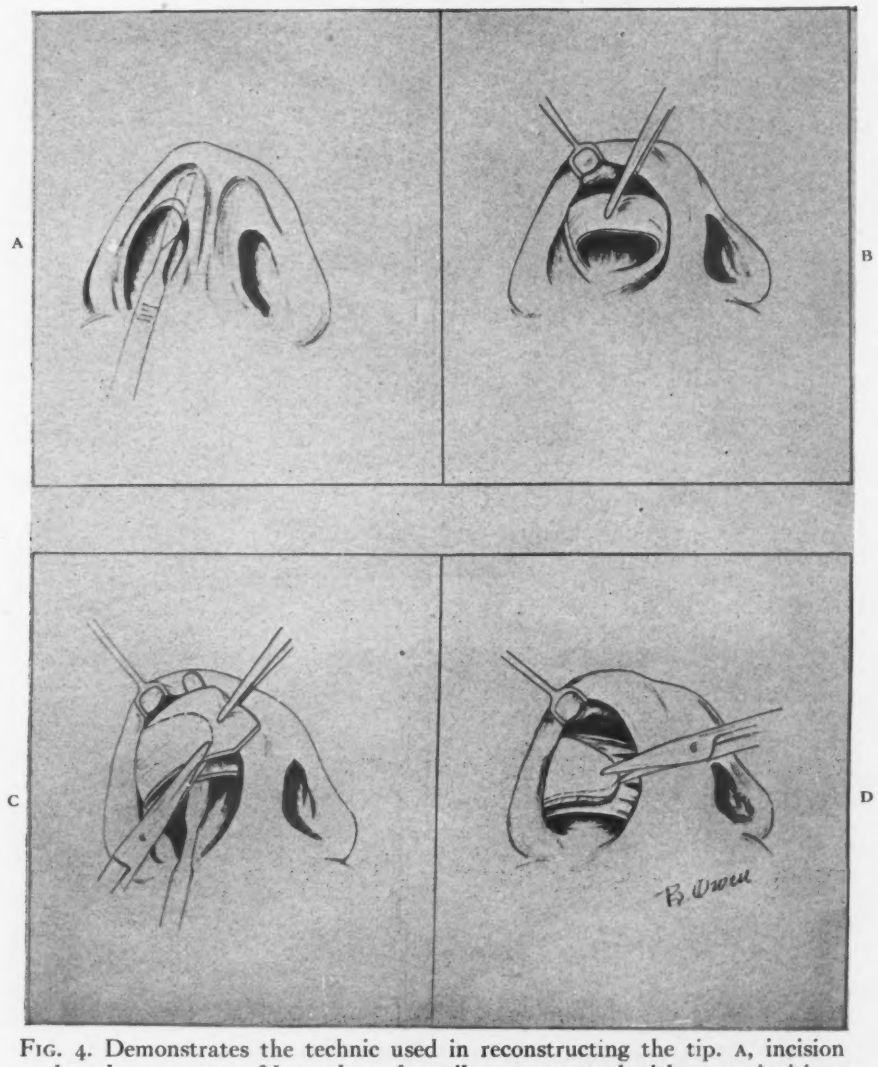


Fig. 4. Demonstrates the technic used in reconstructing the tip. A, incision along lower aspect of lower lateral cartilages connected with upper incision; B, cartilage freed and completely exposed; C, cartilage dissected away from nasal lining and required amount removed; D, excess trimmed from inferior aspect to improve contour of nostrils.

The normal temperature of the nose is 32 degrees and the ciliary action decreases when the temperature drops down to 5 degrees, and further decrease stops the movement. If the temperature is now increased to 18 degrees, the cilia beat very quickly; and if further increased to 43 degrees, the action stops. When the tem-

perature is reduced back to 32 degrees the cilia are no longer viable.

The cilia may regenerate after destruction and will continue to function even in the presence of thick pus. If cilia do not return, they are replaced with fibrosis and bands of adhesions.

The effect of drugs and physical agents on cilia are clinically important. *X*-ray in several times the normal exposure does not stop ciliary action. Cocaine and adrenalin are most deleterious to cilia: a 1/10,000 adrenalin solution is borne fairly well but stops them after a time; a 5 per cent cocaine solution may deter action but anything stronger stops movement immediately. Ephedrine, benzedrine and neo-synephrin in physiological saline have very little effect on cilia. Interestingly, adrenalin with ephedrine is less deleterious than when

FIG. 5. Congenital deformity with a hump nose, flattened upper lateral cartilages, deformed dropped tip, with a hanging columella. A and B, before; C, cast taken before surgery allows for careful measurements; D, after rhinoplasty.

A B

FIG. 6. Saddle nose deformity. A, before, depicting depression over anterior aspect following injury; B, autogenous rib cartilage was used and placed over the depression through an internal incision. The inferior aspect of the cartilaginous strut extended to the nasal spine. Preserved cartilage may be used.

A B C

FIG. 7. Flattened nose requiring cartilage transplant through a columellar split incision. A, cast taken before surgery; B, before, showing collapse of the columella with marked retrusion of upper portion of lip; C, after, rib cartilage was taken, carved to a triangular strut and placed beside the septum through a columellar split incision. Anteriorly, the cartilage extended from the nasal spine to the tip and extended up to the glabella. Plate of cartilage placed beneath the upper portion of lip.

used alone. Menthol, eucolyptol and camphor have a mild slowing effect, and have no other beneficial actions. Thymol stops the ciliary movement. Merthiolate and metaphan slow and then stop the action. Mercurochrome retards it. Argyrol markedly effects the viscosity of the surface covering and mechanically interferes with ciliary motion. Oil has caused much controversy and because with no advantages and many disadvantages it should not be used, and all nasal solutions should be made in physiological saline solution. Alcohol in 30 to 35 per cent solution when in physiological saline will not harm the cilia. Tap water will stop them after a time. Gas, ether and chloroform in vapor have no effect on the cilia, but in solution will stop the movement immediately.

Careful cleaning of the nose following surgery is most important. The thick tenacious mucus may be removed with gentle suction, the crusts carefully picked off, thus restoring the normal physiology as soon as possible.

Blockage of the Nose. Many patients seen by the plastic surgeon present problems of mechanical blockage which in turn upset the physiology of the nasal passage. A deviation of the septum may prevent free entrance of air, disturb its pathway back above the inferior turbinate, and also prevent normal drainage of the sinuses. If a submucous resection is necessary, not only should the deviated cartilage be removed, but a goodly portion of the ethmoid plate along with vomer bone and also the maxillary ridge.

Obstruction may be caused by the inferior turbinate. Its usual cause for swelling is allergy, vasomotor rhinitis or a combination. Naturally, the allergens and dust factors as stressed by Hansel[13] should be investigated; but if the patient is not relieved, cauterization should be used. The surgeon may use the actual cautery, electrocoagulation or acid. Personally, we prefer the first method. In any case, the principle should not be forgotten, namely, to streak the turbinate from posterior to anterior surface down to the bone so as to allow the fibrous tissue an anchor with which to retract the mucosa.

A B

Fig. 8. Old fracture with fragments almost protruding through skin over the bridge; A, before; B, after rhinoplasty.

Polyps, tumors or bony obstruction should be considered and eradicated.

Evaluation of Congenital and Traumatic Deformities

An exact history pertaining to previous operations and trauma is most important before a thorough examination of the nose both externally and internally.

Points to be considered are the bridge, formed by the nasal bones and the nasal process of the maxillary bones. While the former suffers displacement, over-riding, protrusion and depression, the latter is disturbed much less frequently. The upper lateral cartilages are carefully examined both externally and internally. The lower lateral cartilages, which carry most of the fault in deformity of the tip, are gauged, and the columella is examined.

A most important observation is that of the triangle of the nose as seen when the patient tips the head backward (Fig. 15B) as stressed by Brown.[4] The assymmetry of the lower lateral cartilages may be

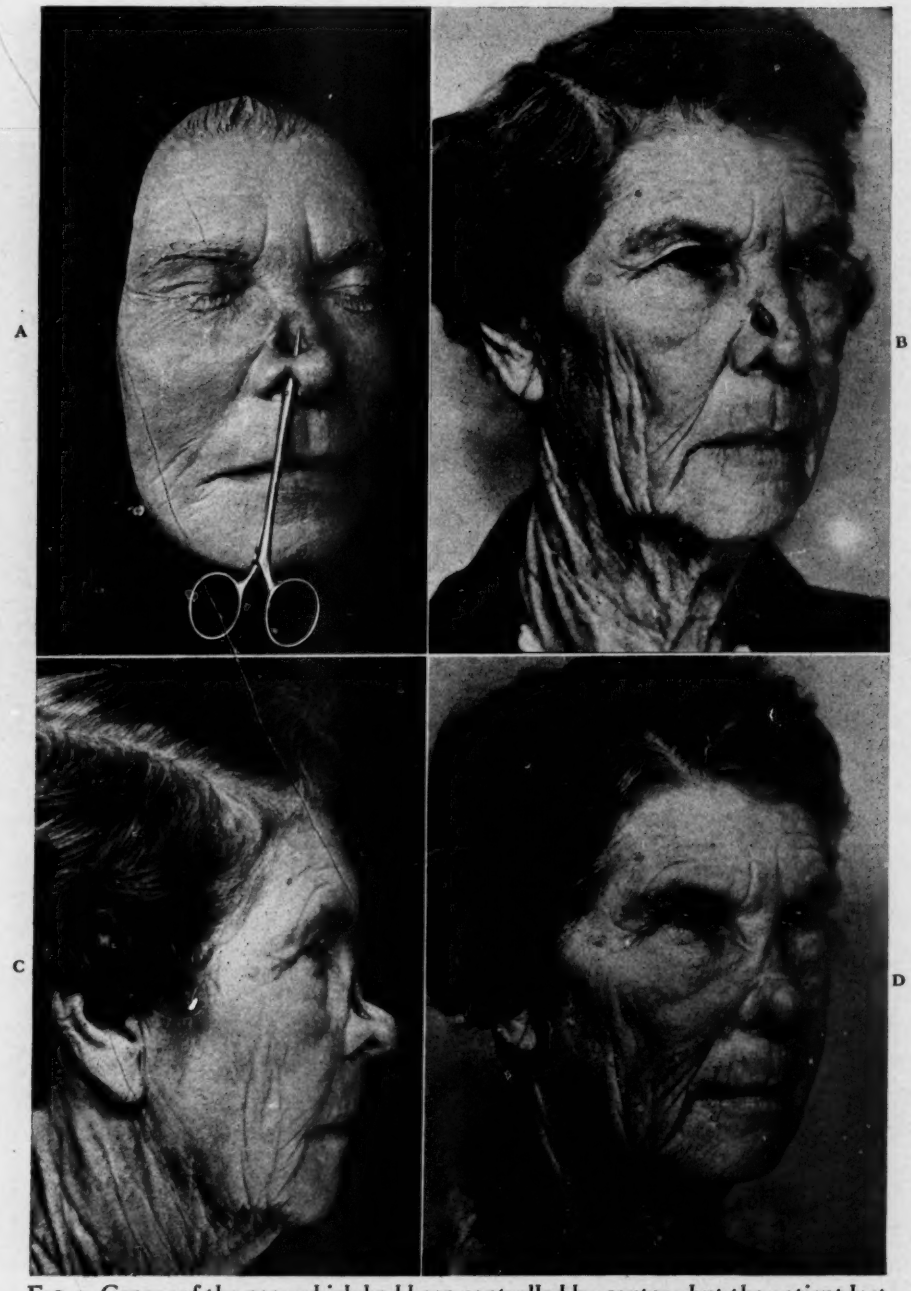


FIG. 9. Cancer of the nose which had been controlled by cautery but the patient lost much of the nose, septum and cartilages when she succumbed to a "professor with cancer paste" four years ago. A, cast, demonstrating the extent of the defect; B and C, before surgery; D, three weeks after surgery; the defect was closed in one stage using the skin around the hole as lining and utilizing nasolabial flaps on either side to cover the whole defect. A section from the anterior tip of the septum was removed and the lower lateral cartilages on both sides were trimmed so as to conform the tip to the flattened bridge. Cartilage will be inserted over the bridge at a later stage.

observed, and also their relation to the columella. Often the septum may be seen encroaching to either side, causing block-

which can be autoclaved is carved and present during surgery. Postoperative photographs are taken with the same exposure

A B C

Fig. 10. Cancer of the nose which had been controlled, repaired with a forehead flap. A, defect on nose dissected out, forehead flap raised and lining grafted to the tip of the flap before it was sewn back in place; B, forehead flap raised, tubed and sewn to nasal defect. Thick split skin graft previously applied to forehead has taken and will cover part of defect; C, six months following final stage.

age. Sometimes the patient complains of a wide base which often proves to be optical when measurements are taken.

The internal examination is most important and observation of the septum, the turbinates or the presence of polyps, spurs or tumors is noted. If allergy is suspected, a smear of the nasal secretions should be taken.

For a thorough study, careful photographs and a cast of the complete face are made on each case. (Figs. 1, 5, 7, 9, 11 and 13.) Defects that do not meet the eye on initial examination are brought out by these adjuncts. The surgical correction must not only be anatomical, but the result must fit the patient's face. (Fig. 21.)

The plaster cast of the face is made and one side of the nose either marked off or cut down to demonstrate the amount of correction. If the nose is to be reconstructed by the addition of cartilage, clay is used in modeling and from this a pithwood model

and position so that an honest comparison may be made.

Anatomical Aspects of Deformity

The hump, depression, or assymmetry may be congenital or traumatic. (Figs. 1,3,5 and 22.) The latter may cause unlocking of the nasal bones at the suture line, and with the frontal bone above and the maxillary bone laterally, with an overriding of the edges and resultant deformity. Too, the bones may be fragmented and callous formation may veil the exact anatomical diagnosis.

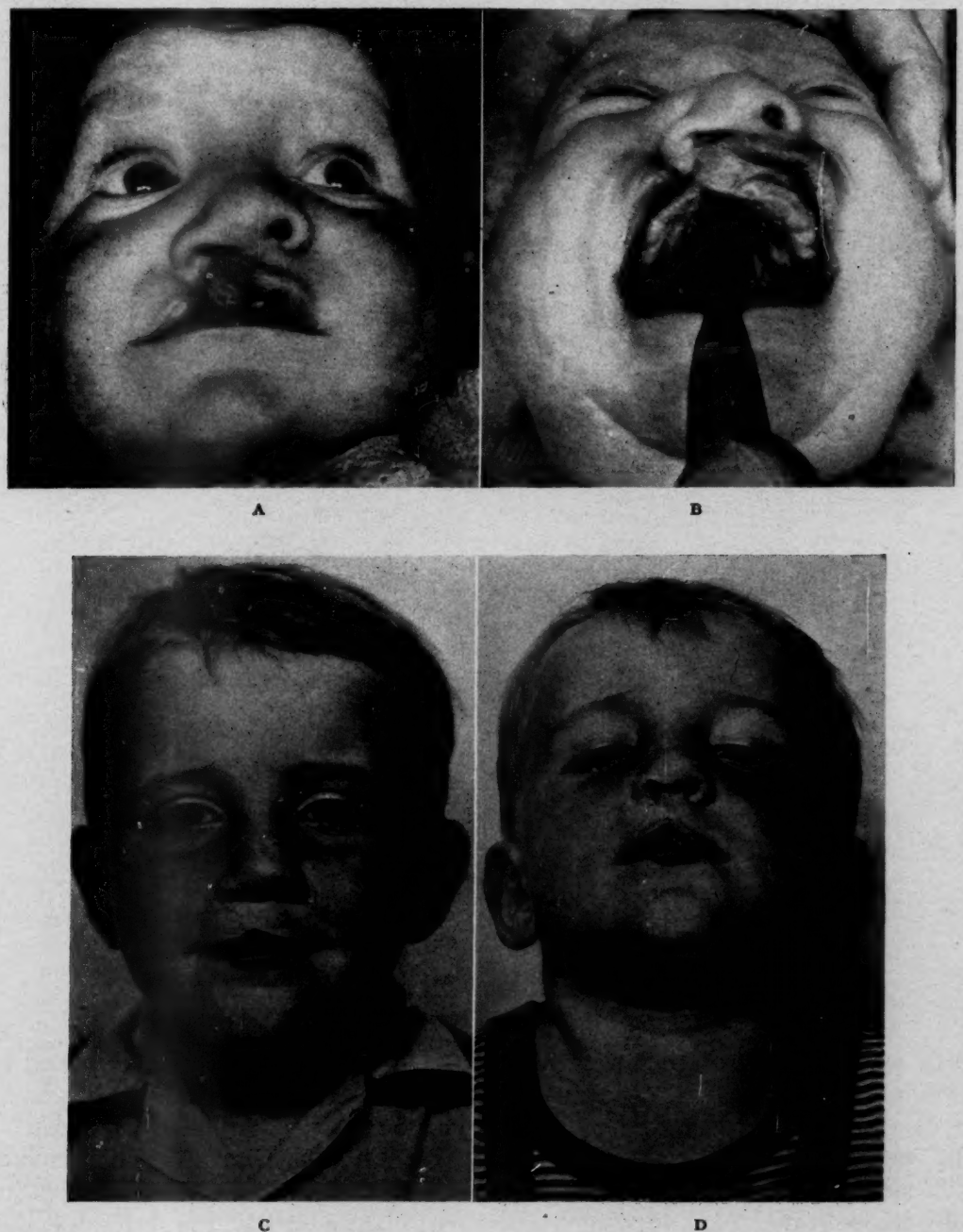
Upper Lateral Cartilages. These form the body of the nose and with a hump, flare anteriorly; with a broad bridge, they are usually widened and flat; with a depressed bridge, usually following trauma, they are sunken and deviated (Fig. 1A); with an old hare-lip nose, they may be flattened and depressed on the affected side. (Figs. 12, 13 and 14.)

A B

C D

FIG. 11. Injury of the nose with severance of ala on both sides, evulsion of large flap over nose and numerous scars; A, before; B, cast taken before surgery; C, close-up of deformity; D, after rhinoplasty was done first to make the nose smaller and gain tissue. Incision made over the bridge through old scar, the skin was carefully undermined from the mucous membrane lining and reflected downward. A portion of the anterior columella was removed by two V incisions 1 cm. apart. The tip of the nose was formed with the reflected skin from the bridge of the nose. A full thickness graft was taken from behind the ear to cover the defect over the bridge and the former took 100 per cent. Pictures taken eight weeks after surgery with further repair to follow.

The cartilages are usually assymmetrical and so in their growth may cause the nose to twist to one side or the other. It has been noted that obstruction to breathing occurs in cases with long upper lateral cartilages and a dropped tip. The passage is narrowed to the extent that the smallest amount of mucus will close it; this constant barrier upsets the physiology of the nose, preventing normal drainage. Often the patient will make the diagnosis for the doctor by explaining that he is able to breath by grasping the nasal ala on each side with the thumb and forefinger and pulling it out and



A B C D

Fig. 12. Hare-lip and nose deformity. A and B, requiring closure of the defect and reconstruction of the ala nasi; C, case three years later showing good protrusion of upper lip and straight base of nose; D, after surgery, lip and vermillion border readjusted; scars removed; ala overcorrected to new position.

up; thus pulling the upper lateral cartilages away from the septum.

When narrowing a large hump nose, it should be remembered that not only must the lower protruding portion of the upper lateral cartilages be removed, but a hyperbolic wedge must be taken on either side, mesially, so as to blend with the newly created narrow bridge.

A direct blow on the nose may cause a depressed fracture of the cartilages with or without disturbance of the nasal bones. This must be recognized by clinical examination and *x*-ray. After correction, Simpson splints are helpful.

Septum. Most septums are deviated. This may be due to childhood trauma because the Negro with a naturally flatter nose and so less liable to reflected trauma, shows less septal deviation.

FIG. 13A–D. For descriptive legend see opposite page.

The crooked nose, the depressed bridge, the twisted tip is usually indicative of an accompanying deviated septum, which is probably secondary. The deviation is caused by a deflected ethmoid plate or a mal-alignment of the ethmoid and the vomer. Interestingly enough, a skull viewed posteriorly through the choana will virtually never show anything but a straight vomer bissecting the two sides, so that fractures of the vomer are always more anterior with a result that the cartilaginous septum twists or bends on the whim of these bones.

An accompanying submucous resection should not be done unless the septum is either causing blockage of breathing or preventing the ostia from draining.

E F

FIG. 13. Old hare-lip and nose presenting typical bad deformity of short tight lips with thin vermillion border, flattened nose on one side with disappearing columella, overhanging tip and markedly assymmetrical nostrils. A, cast taken before surgery from which pithwood models were made; B, C and D, before; E and F, after. The hump was removed with bayonet saws, the nasal process of the maxillary sawed through and fractured mesially to form a new bridge, the upper lateral cartilages trimmed and the tip completely reconstructed by undermining, and trimming the lower lateral cartilages. Rib cartilage was taken and a strut inserted over the bridge, another over the columella extending from the nasal spine to the tip. No external incisions were made over the nose. A curved, beveled piece of rib cartilage was inserted through the old lip scar and wedged under the nose over the entire lip.

If the cartilaginous portion of the septum is deflected to one side, attempt at correction may be made by either fracturing it, detaching it from its abnormal position and returning it to the vomer groove as suggested by Metzenbaum,[18] or following the technic of Brown,[4] and passing a wire through it, guarded by a lead plate and attaching the former to a biscuspid tooth for seven to ten days, by performing a thorough submucous resection and removing sufficient ethmoid plate and vomer posteriorly to break the spring, or adhering to Sheehan's[29] technic and incising the anterior portion of the septum after deflecting the mucous membrane. Often a combination of these technics is necessary, and even then they are sometimes unsuccessful.

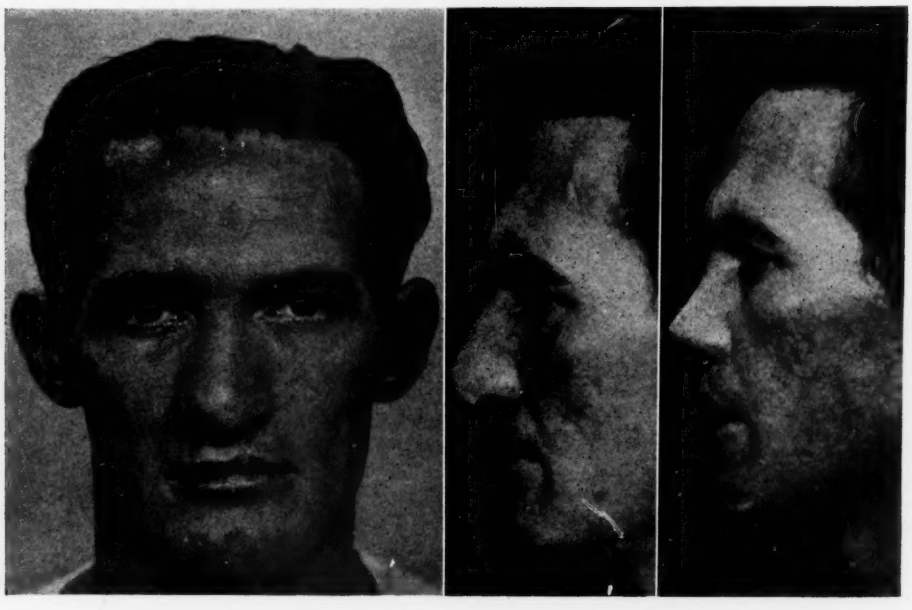
Spurs on the septum may have to be removed prior to rhinoplasty in that the narrower nasal arch may impinge on them and cause obstruction.

Associated with a long nose is an overhanging septum and for its correction a wedge of the septum and mucous membrane is removed. (Fig. 5.) Oftimes the upper lip, immediately beneath the columella protrudes. For its correction, the nasal spine is removed with a sharp chisel.

Lower Lateral Cartilages. The lower lateral cartilages form the shape of the tip and with the aid of the septum hold the tip of the nose outward. Their contour fashions the size and shape of the nostrils. With the head tipped far backward, the triangle of the nose may be studied, and the cartilages on both sides compared.

A cleft tip which may be traumatic or congenital requires careful undermining beginning at the arch of the lower lateral cartilages and extending back along their mesial wing. After this is accomplished, a silk stitch is buried beneath the skin adhering the two wings of cartilage. Such a stitch should be taken in all cases and tends for a more shapely nasal tip.

The retrousse tip is corrected by taking a hocky stick portion of the lower lateral cartilage, wider at the handle, and the removal of a portion of septum along its anterior aspect. Often, the tip may appear retrousse because of a flattened bridge and may require the introduction of cartilage rather than surgery on the tip. The flattened tip may require a cartilage wedge placed through a columellar incision. (Fig. 7.)



A B C

Fig. 14. Old hare-lip and nose deformity. A, before, showing depressed scar, assymmetrical lip longer on left side, with typical nasal deformity flattened on one side, narrowed vermillion border; B, before, retruded lip upper, nasal deformity with overhanging tip; C, after complete rhinoplasty with special attention given to tip reconstruction. The lip was narrowed and vermillion border adjusted by removing a complete wedge.

Columella. The character of the columella, be it long, short, narrow or wide, will affect the shape of the nostrils. Often an oblique columella will be straight when more lower lateral cartilage is removed from one side than another. A retracted columella may require the introduction of a cartilage strut through a small separate incision. A hanging columella may be corrected by removal of a portion of skin from both sides. Occasionally, surgery is required on the columella itself, such as a z-flap at the base for the correction of an abnormally oblique one or a v to y incision at the base for one especially short.

The shape of the nostrils is dependent upon the lower lateral cartilages. In an abnormally flat nose with convex ala, it may sometimes be necessary to remove a full thickness section from the most lateral aspect of the ala and reattach it to the cheek. Sometimes, the wedge may be

taken from within the nose, thus leaving no scar externally.

Base. In measurements taken of the base at the attachment of each ala, using casts taken from 200 female patients, the average was found to be 1¼ inches with the variance no more than 1/16 inch. However, the construction of the patient's face, its wide or flat contour may often present an illusion that the base of the nose is wider than ordinary. Actual measurements should be taken by the surgeon, both for his own benefit in gauging the reconstruction and for the benefit of the patient.

A B C

Fig. 15. Congenital deformity of the nose in a fourteen year old girl. This is about the minimum age at which a total rhinoplasty should be done. The psychic complexes often present make early surgery mandatory. A, before surgery; B, before; demonstrating the triangle of the nose formed by the base and laterally by the alar walls and bissected by the columella; C, after rhinoplasty.

Nostrils. The size of the nostrils is dependent upon the width of the columella, the base, the position of the septum and the shape of the lower lateral cartilages. Few noses present two equal sized nostrils. A septum deviated near its columellar portion will present itself near the median aspect of the nostril, causing the latter to be assymmetrical.

Where nostrils are abnormally assymmetrical, a portion of the medial wing of the larger may be bent toward the smaller, thus giving it more cartilaginous framework.

Straith,[33] Pierce and O'Connor[24] and others have discussed the technic of handling atresia of the nostrils. We use a thin split skin graft placed around dental stent and inserted in the nostril. (Fig. 16.)

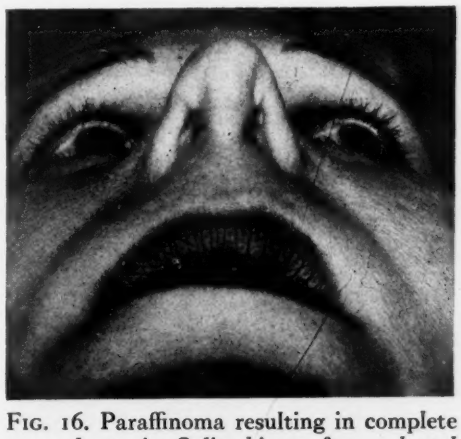


Fig. 16. Paraffinoma resulting in complete nasal atresia. Split skin grafts on dental stent were inserted in each nostril to form a new lining.

OPERATIVE PROCEDURE

Preoperative Treatment. The patient enters the hospital the preceding night and

is given a full dose of barbiturate. The following morning, two hours before surgery, a similar dose is given. One hour before surgery, morphine gr. ¼ and scopolamine gr. 1/150 is administered by hypodermic. These preoperative measures not only serve to prepare the patient fully following a good night's sleep, but also act as a physiological prophylactic against novocaine or cocaine toxicity. When general anesthesia is used, appropriate preoperative measures are taken.

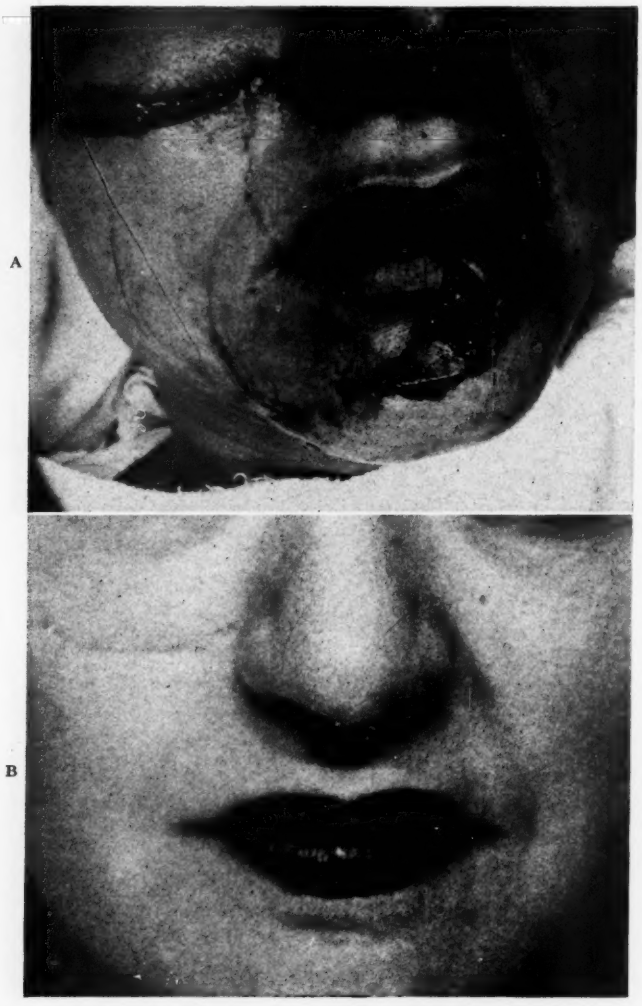


FIG. 17. Scars over the nose and face. A, before; meticulous cleansing of the tissue is primary; B, after; the subcutaneous tissue is approximated with No. ooo white silk; the skin sewn with No. ooo to No. oooooo black silk. Following early removal of stitches, adhesive bridges are used to maintain tension.

Anesthesia. Except in occasional cases, local anesthesia is used exclusively. One half hour before surgery, applicators saturated with cocaine 10 per cent are applied to the region of both sphenopalatine foramen near the posterior aspect of the attachment of the middle turbinate. Following this, both sides of the nose are carefully packed with cocaine 10 per cent to anesthetize the branches of the sphenopalatine ganglion supplying the mucous membrane of the nose. These packs are allowed to remain and are removed at surgery.

After the face has been thoroughly washed and the vibrissae clipped and a suitable, mild antiseptic applied in and

around the nostrils, the patient is carefully draped. The eyes and mouth are covered with damp gauze.

A short ribbon retractor lifts the nostrils, exposing a fold between the upper and lower lateral cartilage. Novocaine 2 per cent with 15 drops of adrenalin to the ounce is injected in this area on either side, thoroughly undermining the tissues over the nose. The solution is further infiltrated, blocking off the nerve endings of the supra-trochlear, infratrochlear and infra-orbital nerves. The columella is anesthetized and injections are made into the nasopalatine nerve on both sides as it dips into Scarpa's foramen.

Later, injections are made along the lower lateral cartilages which gently balloon the tissues away allowing for more thorough clean dissection.

In all, 15 to 25 cc. of novocaine is used and the anesthetic is gently massaged into the tissues so that it will act as a more efficacious anesthetic and hemostatic agent. Following this, a one inch "nu gauze" packing is used in the nostrils to prevent any bleeding into the throat.

Operative Procedure. A short retractor lifts the nostril and using a No. 11 Bard Parker blade, an incision is made between the upper and lower lateral cartilages, brought forward and slightly downward, joined with the opposite incision and carried down between the septum and columella. Using a curved Mayo scissors, the skin over the nose is thoroughly undermined leaving as thick a flap as possible.

An incision is made through the periosteum on either side over the bridge and the former is reflected medially. The hump is removed with right and left bayonet saws and smoothed with a fine rasp. Moist applicators are used to wipe out any bone fragments or dust.

The upper lateral cartilages are severed from their medial septal attachment and the excess trimmed. The anterior aspect of the septum is shaved down to the desired proportion.

Through a separate incision in the lateral aspect of the nasal vestibule, angle periosteal elevators are first introduced, followed by bayonet angle saws and the nasal process of the maxillary bone is sawed through on both sides. With a piece of gauze over the bridge and the aid of gentle, steady pressure, the distal fragments are fractured toward the mid-line forming a new bridge.

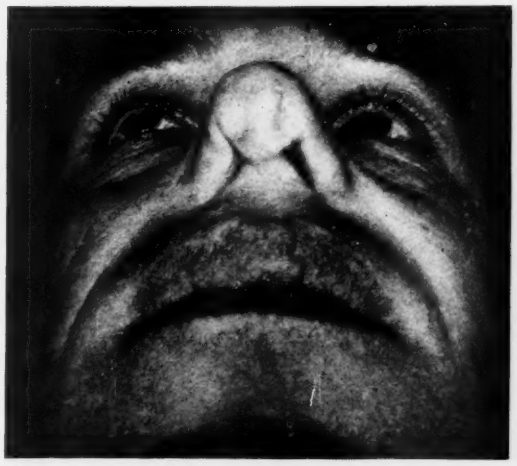


FIG. 18. Paraffinoma of ten years' standing. Showing the gravitation of the paraffin to the dependent portion and the resulting fibrotic reaction. The tip of the nose was undermined and an attempt was made to remove the granulomatous material and fibrous tissue. Histological picture presents multinucleated giant cells and on occasion the area may become neoplastic. The skin over the center of the nose was reflected down to form the new tip and a forehead flap was brought down to cover the defect.

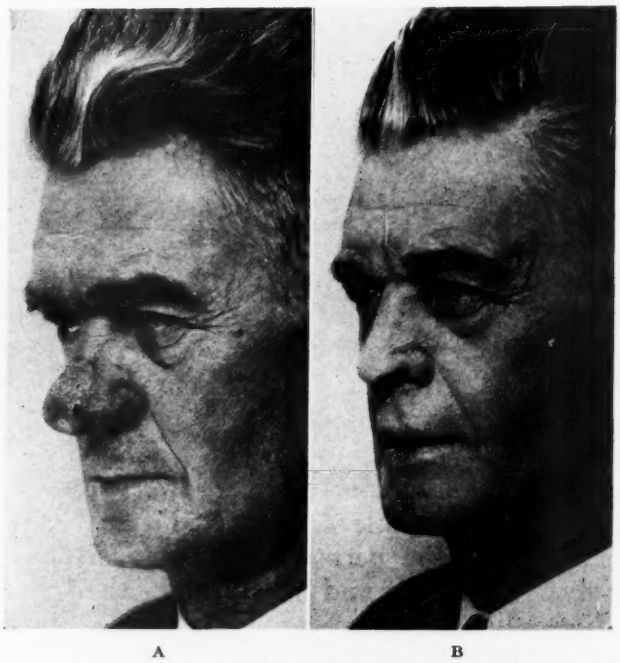
Through incisions along the lower aspect of the lower lateral cartilage, the latter are dissected free (Fig. 4) and the required amount of cartilage is removed without disturbing the nasal lining. Where required, a wedge of septum is removed from its inferior aspect.

A tension suture of No. 1 silk approximates the columella and septum, while the mucocutaneous incision is sewn with No. 000 silk. The nostrils are packed lightly with vaseline gauze.

Various postoperative splints are applied: the dental stent as recommended by Aufricht[1] and the metal splints as used by Brown.[4] As a rule we use adhesive alone

A B

FIG. 19. Angioma of the nose which was treated both surgically and with radium; A and B before surgery.



A B

FIG. 20. Rhinophyma of the nose of thirty years' duration. Treated surgically with an incision from ala to ala, one-fourth inch from the alar margin. The skin flap over the nose was raised, the underlying tissue dissected away down to the cartilage. A section of skin was taken off the flap and then the latter was sewn in place with black silk. Suberythema doses of *x*-ray were used after surgery.

over the bridge and ala with satisfactory results.

Postoperative Treatment. Iced cloths are applied over the glabella and eyes and these are continued for several days. The patient is advised to open and close the eyes frequently which aids in eliminating the edema. The initial dressings and packs are removed in twenty-four hours. At this time, the nose is thoroughly cleansed, the mucous membrane shrunk with a suitable solution, vaseline is placed over the stitched areas, and adhesive reapplied to the bridge and tip. If a metal splint has been used, it is reapplied for another twenty-four hours.

FRACTURES OF THE NOSE

Recent. Straith and De Kleine,[34] Safian and Tamerin[27] have emphasized the importance of early diagnosis and treatment. Within the first week, but preferably within the first few hours, fractures are considered recent. Those without deformity or displacement are treated conservatively. The diagnosis is made both clinically and with the aid of *x*-ray (an ordinary dental film taken in the lateral view usually being the most helpful).

The signs and symptoms of fracture are epistaxis, swelling, intranasal blockage, crepitus, pain and deformity. Thorough shrinking and cleansing of the nose will make for a more accurate diagnosis.

After suitable anesthesia a medium sized needle holder protected by rubber tubing is inserted through the nostril, upward and anterior; using gentle, steady pressure with the instrument the fractured bones may be replaced to their normal position. An Ash forceps is used when the fracture has occurred through the nasal process of the maxillary bone. Adhesive may be used as a postoperative brace.

Septal depressions, fractures of the upper lateral cartilage and displaced compound fractures of the bones may prevent restoration of the nose to its previous shape and later rhinoplastic correction may be necessary. Should the septum be displaced, Metzenbaum's technic[18] may be employed.

Old. Old fractures are reconstructive problems. Not only must the bones of the bridge be reformed but so, too, must the upper lateral cartilages, the septum and the tip. Unless rhinoplastic procedures are carried out, the result will leave both the doctor and the patient unhappy.

A B

Fig. 21. Congenital deformity of the nose in conjunction with retrusion of the chin. A, before; B, after rhinoplasty followed later by insertion of curved molded section of rib cartilage in chin and sewn to periosteum, thus building out chin and giving desired symmetry to face.

SADDLE NOSE

We shall consider all depressions requiring the addition of cartilage or bone in this category.

Autogenous cartilage, advocated by Brown[5] and Peer,[23] or preserved cartilage suggested by Pierce and O'Connor[24] may be used. The former may be taken from the costal rib margin, from an ear or from the nose itself. The latter is stored in the ice box in a merthiolate-saline solution, 1:4. In both the perichondrium should be removed.

If the depression is small, a suitable piece of cartilage may be laid on the anterior aspect of the septum through an intranasal incision. If a larger depression is to be filled, it is necessary to maintain a supportive strut between the tip and the nasal spine. (Fig. 6.) It is best that a single piece of cartilage be so cut, bent and beveled that it runs from the glabella to the tip of the nasal spine. New and Erich[21] have been treating such cartilage to prevent its curling or warping.

Some deformities are such that they require the cartilaginous strut to be inserted through a columellar split incision. (Fig. 7.) After the mucous membrane is dissected away from the more spacious side of the septum, a wedge of cartilage is inserted. The use of a rounded rectangular piece of cartilage has several advantages: It may be thinned more without losing its strength and there is less tendency for the cartilage to curl. Care should be taken to thin that inferior portion resting on the columella to prevent the latter from being too wide.

Should the occasion arise, it might be necessary to use bone to fill the depression. Products foreign to the body such as ivory, plastics, metals, paraffin, etc., are to be condemned.

A B C

FIG. 22. Old fracture of nose in conjunction with congenital deformity demonstrating nasal hump, a central depression, protruding tip and a disappearing columella. A and B, before surgery; C, after reconstruction.

HARE-LIP NOSE

Old hare-lip noses should be repaired with the aid of rhinoplasty. External incisions are unnecessary and the work should be done within the nose. Brown and McDowell[6] rightfully stress the importance of considering the nose as a whole and when necessary removing lower lateral cartilage from the opposite side to make it conform with the affected side. Cinelli[9] often uses this removed cartilage and inserts it into the affected side.

Wherever possible the patient should be allowed a few years after adolescence before a complete corrective procedure is attempted. However, rather than allow a child to attain a reasonable age carrying a physical stigma, interference is often resorted to before the child reaches maturity. In these cases, sufficient surgery should be done to allow for a reasonable cosmetic improvement without interfering too much with the cartilage or the nasal framework

keeping in mind that a more thorough reconstruction will be done at a later date. (Fig. 12.)

time should be taken at the initial surgery in repairing the latter. We make a practice of thoroughly undermining the lower lat-

A B C D

Fig. 23. Old fracture of the nose with a dislocated septum. A and C, before; demonstrating the broad flattened dorsum, dropped tip and disappearing columella; B and D, after reconstruction; it was also necessary to relocate the septum into the vomer groove.

Many of the defects seen in secondary hare-lips might be avoided at the initial operation. Repairing the lip itself secondarily is usually not too difficult; the nose as a rule is the problem. Therefore, more

eral cartilages both anteriorly and posteriorly so that when the point of the ala is turned inward and over-corrected in its angle to the columella, the cartilage will slide to its new position and is easily held

in place with silk mattress sutures. A crescent of lining in the vestibule may be removed on the affected side to eradicate the flare often present following the repair of a hare-lip.

When repairing an old hare-lip nose we remove a hockey stick of lower lateral cartilage from the unaffected side, while on the affected side, the lower lateral cartilage is severed at the arch, the lateral wing is undermined and no cartilage is removed which allows the nostril to assume

A B C D

FIG. 24. Old fracture of the nose with a dislocated septum. A and C, depicting the associated congenital deformity, namely, the nasal hump and the long anterior posterior tip dimensions; B and D, after surgery; relocation of the septum into the vomer groove and reconstruction of the nose to the required dimensions.

larger proportions. Much of the deformity may be laid at the doorstep of the upper lateral cartilage because on the affected side it has flattened out and lost its natural curve, whereas on the opposite side the angle of the curve is usually over-acute. Usually there is a disappearing columella especially where it joins the philtrum and a cartilage strut is necessary. (Figs. 12, 13 and 14.)

TUMORS OF THE NOSE

Classification:

Benign:
1. Papilloma
2. Adenoma

Connective Tissue:
1. Fibroma
2. Chondroma
3. Osteoma
4. Myoma
5. Myxoma
6. Osteochondroma
7. Angioma
   a. Hemangioma
   b. Lymphangioma

Malignant:

1. Epithelial
   a. Carcinoma
      (1) Squamous cell carcinoma
      (2) Basal cell carcinoma (Rodent ulcer)
      (3) Transition cell carcinoma (Grade 4)
      (4) Columnar cell carcinoma
   b. Adenocarcinoma
2. Connective tissue
   a. Sarcoma
      (1) Fibrosarcoma
      (2) Osteosarcoma
3. Miscellaneous
   a. Hodgkins
   b. Lymphosarcoma

Benign. Papillomas are said to arise from the papillae of the basement membrane, and usually occur where there is squamous cell epithelium. The infantile type which may or may not be caused by a filtrable virus, recur easily, may be transplanted and their excision or cauterization should be done with this in mind. The adult type usually responds to the snare.

Adenomas are rare and occasionally occur in the nose and pathologically may or may not have ducts. The growth should be excised.

Fibromas occurring in the nose may be distinguished from polyps being redder and do not have the bluish, translucent appearance, but are difficult to distinguish clinically from sarcomas. They may bleed very easily when excised.

Chondromas are rare and microscopically present a picture of normal appearing cartilage in an abnormal position.

Osteomas usually arise from the nasal bones, are painless and may cause pressure symptoms and cosmetic deformity. Microscopically, they present a picture of distorted Haversian systems and absent marrow. These and chondromas are easily excised and do not recur.

Angiomas are not uncommonly seen in Hesselbach's triangle and on the tip of the nose. They usually react favorably to radium. (Fig. 19.)

Malignant. Squamous cell carcinomas may be differentiated by the Broder classification. The amount of cell mitosis present the degree of cell differentiation, the amount of fibrous tissue around the tumor, the presence of pearls in the cellular structure, all serve to judge the tumor. Though the degree of malignancy in this classification definitely affects its operability, the reaction to radiation therapy is highly variable and does not depend upon the classification.

Basal cell carcinoma behaves like benign tumors and usually invades by direct extension without metastasis. Incidentally the tumor apparently does not arise from the basal cells because microscopic sections show no relationship. The growth should be thoroughly excised with the scalpel or cautery.

Transition cell carcinomas may occur in the sinuses and extend into the nose.

Though they present lymphatic cells on microscopic examination in association with the epithelial cells, the former are probably normal cells in a carcinomatous area.

The growths are usually extensively malignant by the time diagnosis is made and the treatment, therefore, is radiation because the tumor has usually metastasized extensively.

Fibrosarcomas, occasionally found in the middle turbinate, bleed easily, present a beefy red appearance and because the blood supply contains no endothelial cells, a major hemorrhage may occur. It responds readily to radiation.

Osteosarcomas arising from the bony structures are rare in the nose.

Endotheliomas arising from the meninges may hang down into the nasal vault. They metastasize late and by the blood stream.

Blair, Moore and Byars[3] have classically described malignant lesions, their diagnosis, treatment and the reconstructive method. A time period should be allowed to elapse between the removal of all malignant growths and reconstructive surgery. Too often one sees recurrence after a lengthy piece of surgery. Though excision or cauterization of malignant tumors should be radical, the hand should be guided by the thought of future cosmetic improvement by plastic procedures.

TOTAL RESTORATION OF THE NOSE

Blair[2] has aptly stated that a surgically reconstructed nose must be covered with smooth skin, have a normal contour, have epithelial lining and provide an adequate airway. There are many methods of transferring a raised pedicle or tubed flap, and each asks for meticulous planning and judgment. One may use a forehead flap, a clavicular tubed pedicle taken directly or waltzed to the nose, a tubed pedicle from the body transferred to the wrist, or from along the neck extending from the mastoid process to the clavicle. All of these methods have been discussed by Blair,[2] Gillies,[12] Ivy,[14] New,[20] Smith,[31] Maltz[17] and others.

The original method of Nelaton and Obre'danne[19] used in modification by the above authors in conjunction with a forehead flap is most appropriate for the formation of the lining, of the ala and of the columella. After careful measurements, a flap on the forehead is raised and a split skin graft is sewed to the apposing side, raw surface approximating raw surface at a sufficient distance from the end to form lining for the bridge of the nose. Another thick split skin graft, cut with Padgett's dermatome,[22] is sewed on the forehead to cover that area from which the flap is later to be taken. The entire flap is then sewed back in place and in a period of three or four weeks again elevated. The distal end is now thinned and turned on itself to form a lining for the lower portion of the reconstructed nose. The deformed nose having been carefully dissected so as to leave a raw bed, the pedicle is turned downward and meticulously sewed in place.

In three to four weeks, the pedicle is detached, leaving the required amount of tissue on the nasal defect and the remainder is returned to the forehead to cover the previously created defect. The excess tissue on the nose may be trimmed after the induration has subsided. To create nasal framework, autogenous rib cartilage, necrocartilage (Lamont), or bone may be appropriately modeled and inserted beneath the tissues to form an anterior bridge. Sulfanilamide crystals are sprinkled on all cartilage grafts before they are implanted.

The most important principles to be remembered are to retain the integrity of the circulation of the pedicle during its transfer; trauma or excessive handling and twisting will cause thrombi and hematoma and the pedicle may be lost. Care should be taken in the measurement before surgery, so that one is not embarrassed by lack of tissue and sufficient pedicle should be allowed for shrinkage. One is always in a dilemma when thinning out the tip

before doubling on itself. If made too thin, the circulation may be lost along with the tissues, and if made too thick it is cosmetically unsightly.

SUBTOTAL RECONSTRUCTION OF THE NOSE AND THE NASAL TIP

Surgery about the nasal tip and partial reconstruction of the nose are more common than total restoration. Kazanjian,[16] Straatsma,[32] Straith,[33] Smith[30] and others have presented cases covering the problems confronting the plastic surgeon. Gillies[12] carefully reviewed the conditions in which tube flaps are preferable to free skin and outlined the common donor sites for tubed pedicle flaps, the operative technic and the plan to be followed. More leeway is possible in partial restoration than in total; however, if the defect is large, the forehead is still the site of choice from which the pedicle is taken.

The technic is similar to that previously described except that the split skin graft is approximated on the end of the pedicle because the latter is not doubled on itself to form the tip. (Fig. 10.)

For reconstruction of defects on the tip itself, the surgeon has a wide choice of methods. He may transfer a pedicle from the body, use a forehead flap, or a pedicle from the side of the face, or a pedicle may be turned from the upper part of the nose onto the defect, or skin from both sides or one side of the face be readjusted. (Fig. 9.) Recently a case presented itself with a large defect in both ala. (Fig. 11.) Because the patient had a reasonably large nasal skeleton, a new technic was used. Incisions were made immediately below the upper lateral cartilages, carried forward, joined, and the columella severed from the inferior portion of the septum. The nose was then cut down by the technic described in the section on congenital deformities. Following this, an incision was made over the glabella through an old scar, carried downward on the left side, and then with time consuming care, the skin over the nose was dissected away from the lining. The columella was cut loose near the tip and a small portion removed. The skin over the nose was rolled downward and the columella sewed in place. A full thickness graft was taken from behind the left ear and sewed over the defect left on the bridge of the nose. Though over bone and in a potentially infected area, the graft took 100 per cent and the patient had a reasonably presentable nose in one stage.

Bulbulian[8] and others have accomplished much in the field of prosthetic appliances. The latter are both practical and necessary in certain cases. Regardless of what method is used, careful preoperative thought and surgical judgment are presupposed adjuncts.

PARAFFINOMA

Paraffin was used several hundred years ago to aid impotent men maintain their self respect. At the turn of the century it was again introduced for cosmetic purposes. The cheeks, nose, eyelids, neck and forehead were the usual hunting grounds. As a rule, signs of trouble do not appear for some time after injection. Then it gravitates away from the area of introduction and begins to act as a foreign body creating fibrosis and induration, and sometimes the tissue breaks down to necrosis. (Figs. 16 and 18.) Microscopically, they present a granulomatous picture and aside from the fibrous cell infiltration show many giant and plasma cells.

The removal of paraffin is not easy and if present in any amount, must be done in several stages. Because of the fibrosis, cavities may remain with hard walls that will not collapse and fill in; this must be kept in mind and adjacent areolar tissue utilized during operation. The skin over the paraffinoma must be taken out in a section in order to restore the contour. The wounds do not heal easily and often will present a serous drainage until such time as all of the deeper paraffin is removed.

If a large deformity is left or in the presence of skin destruction due to necrosis, a flap or pedicle may be utilized. The

surgeon should always caution a paraffinomatous patient to reserve optimism.

RHINOPHYMA

This is an idiopathic inflammatory disease, overwhelmingly more common in men, and characterized by an early dilatation of the blood vessels. Later there is an invasion of connective tissue affecting sebaceous glands, the underlying fat and the skin. The cosmetic deformity makes it easily recognizable and as it slowly develops over a period of years, the lobulated masses secreting sebaceous substances become more prominent.

In mild cases, shaving the mass with a razor and allowing the undersurface to granulate and epithelialize will help the condition. In exacerbated cases, complete dissection of the mass is necessary and the area may be covered with a skin flap from the bridge of the nose. (Fig. 20.)

SCARS AND KELOIDS

When removing a scar on the nose, the skin should be thoroughly undermined on either side twice the width of the area removed. Either white No. 000 silk or catgut is used to approximate the subcutaneous tissue and No. 000 black silk is used to approximate the edges. In longer scars, two or three mattress sutures should be taken so as to hold the edges everted. In areas of relaxed tissue such as the neck, dental rolls held in place by silk tied over them, are used for pressure. Updegraff[37] has emphasized the importance of adhesive tape bridges postoperatively to prevent spreading of the incision.

Where keloids are expected, suberythema doses of *x*-ray or radium should be used postoperatively. When removing keloids, the roentgen ray may be used as an adjunct to the scalpel. Large keloids may occur regardless and the patient should be so informed.

CONCLUSION

Reconstructive surgery of the nose, aside from the presupposed knowledge of anatomy and physiology, demands careful planning, judgment and patience at the operating table. Gentleness in handling tissue cannot be overstressed, speed is to be condemned and the operative eye must always be focused toward the future cosmetic result.

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MANY minor operations in the mouth can be performed under local anaesthesia, but if the operation is expected to occupy some length of time and bleeding to be free it is wiser to give a general anaesthetic, preferably with the introduction of an intratracheal catheter.

NON-TUBERCULOUS LUNG ABSCESSES

SURVEY OF FOUR HUNDRED SEVENTEEN CASES

VINCENTE D'INGIANNI, M.D.
On Staffs of Charity, Mercy and French Hospitals
NEW ORLEANS, LOUISIANA

BETWEEN the years of 1931 to 1941 there were 437 admissions with diagnoses of lung abscesses at Charity Hospital of Louisiana in New Orleans. Of these, 113 were readmitted. This group was composed of 268 (61.4 per cent) white patients, and 169 (38.6 per cent) negro patients. The majority of patients were admitted between the thirty to fifty year group in both races. Death rate was greater at the extremes of the age groups and proportionately less in the thirty to fifty year group. Of the 437 patients admitted, only 417 charts were complete enough to use in the following statistical study.

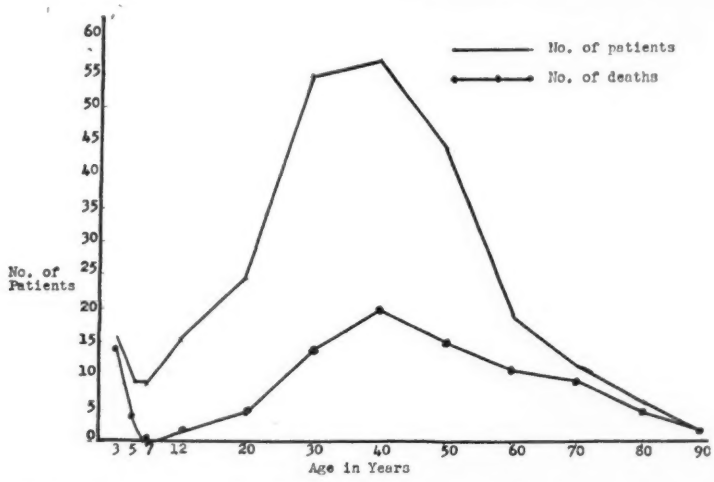

FIG. 1. Mortality and admissions in age group of white patients.

This series deals with the status of patients on their discharge from the hospital. Some who were thought to be cured may have had recurrences, and some who were improved may have progressed until cured. Of these, there were twelve (2.8 per cent) cured, 124 (29.8 per cent) improved, and seventy-six (18.4 per cent) unimproved.

No marked discrepancy was found between males and females of both white or colored races, excepting the occurrence of frequency in the male, the ratio being two males for every female with the disease comparing white and negro patients, which was not only found constant in this study but also in many other statistical studies. Of the total admissions 273 (67.2 per cent) were males. This is in keeping with the following reports:

Author	No. Cases	Males No. Per Cent
Reves	60	40 (66.6)
Fisher	88	58 (66.0)
Jackson	124	83 (65.5)
Neuhof	45	29 (64.5)
Kline	55	38 (69.1)
Lueth	101	87 (86.0)
Cutler	90	61 (67.8)
Allen	100	81 (81.0)
Geay	41	28 (68.2)

There were 205 (49.2 per cent) deaths, as illustrated in Table 1, with appreciable

difference between racial mortality, white 39.6 per cent, negro 60.0 per cent. Lueth found 44.4 per cent mortality rate in the negro group versus 38.6 per cent in the white group. Reves found a mortality rate of 37 per cent in white patients and 50 per cent in negro patients.

Of the 205 deaths, 159 (78.9 per cent) had postmortem examinations, seventy-seven were white and eighty-two were negroes. Many of the patients admitted did not live long enough for a diagnosis, and there were also some that remained in the hospital as long as sixty days without a correct diagnosis, this being established at autopsy. Twenty-seven (6.5 per cent) were demonstrated to have had lung abscesses which were overlooked by the clinician.

In the twenty to forty year group admitted to the hospital 60.7 per cent were white patients and 67.1 per cent were negro patients. Kline reports that 63.8 per cent of his patients belong to the second and fourth decade. It becomes apparent that the mortality rate is inversely related to the age group when one considers that the majority of admissions and the minority of deaths occurred in the twenty to forty age group. The mortality rate was 41.6 per cent for the twenty to forty age group and 57.1 per cent for the rest of the age groups.

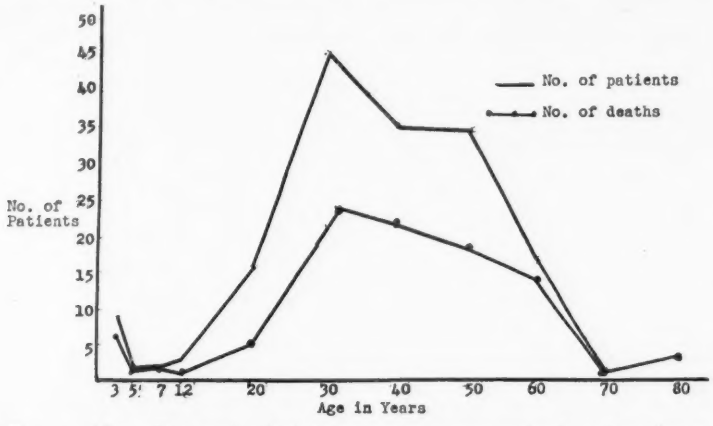

Fig. 2. Mortality and admissions in age group of colored patients.

By referring to Figure 3, it will be noted that the negro mortality rate was higher in each group except the first. One possible explanation, since the period of time elapsing between the onset of the disease and admission is about the same, as shown in Table II, is that the negro is less resistant to infection of the lungs.

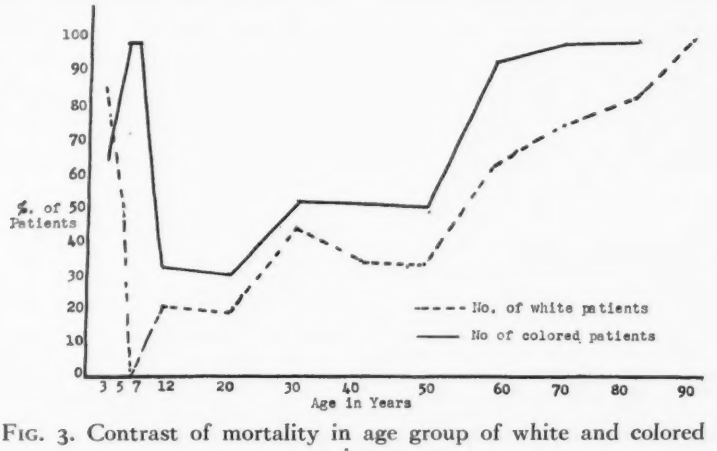

Fig. 3. Contrast of mortality in age group of white and colored patients.

These patients were admitted to the services of ninety physicians and surgeons. Some of the surgeons were gynecologists,

urologists and obstetricians. A few patients were admitted to the Dermatology Ward.

Table III contains the results obtained by those doctors who attended five or more patients. The number on the left of the table replaces the doctor's name. The mortality rates in respect to individual physicians and staffs vary between 20 and 60 per cent with the exception of one who had no deaths.

TABLE I
OUTCOME OF PATIENTS ADMITTED TO HOSPITAL

	C	I	U	D	Total	
White						
Male	7 (3.91%)	55 (30.6%)	39 (21.8%)	78 (43.5%)	179	
Female	2 (2.71%)	30 (40.5%)	16 (21.6%)	26 (35.1%)	74	253
Colored						
Male	2 (1.75%)	27 (23.7%)	14 (12.2%)	71 (62.3%)	114	
Female	1 (2.0%)	12 (24.0%)	7 (14.0%)	30 (60.0%)	50	164
	12	124	76	205		417

C—cured.
I—improved.
U—unimproved.
D—died.

TABLE II
DAYS SPENT IN HOSPITAL IN RELATION TO DURATION OF ILLNESS PRIOR TO HOSPITALIZATION

No. of Months	White		Colored	
	Male, Per Cent	Female, Per Cent	Male, Per Cent	Female, Per Cent
1	25.4	32.5	25.7	20.8
2	33.6	29.1	32.1	21.4
3	17.6	9.5	71.4	5
4	43.5	1	19	0
5	24.8	26	24.5	93
6	25	26.6	28.5	50
7	0	34.5	45.5	0
8	14.2	5	46	0
9	20	8	36	0
10	66.1	82.5	4	0

The etiological factors contributing toward the formation of lung abscesses in 129 of the cases can be found in Table IV. From Table V one can conclude that there is an agreement in the causative factors but a disagreement in the order of their frequency. Reves found that the etiological factor in production of lung abscesses was pneumonia in 61.8 per cent and tonsillectomy in 21.8 per cent. Jackson found the etiology to be upper respiratory infection in 37 per cent, tonsillectomy in 29 per cent, and other surgery in 10.5 per cent. Morrison reported 39 per cent having preceding tonsillectomy and 13 per cent having other preceding surgery. Cutler found that 54 per cent had preceding surgery and 28 per cent had pneumonia. Sweet found 56 per cent followed upper respiratory surgery, 11.2 per cent followed other surgery, and 15 per cent followed pneumonia.

The causes of lung abscesses in 12.4 per cent of the white patients and 12.8 per cent of the negro patients at Charity Hospital can be found in previous surgery. This is not in agreement with the investigations of Jackson who reported 22 per cent following surgery, Morrison 52 per cent, and Cutler 54 per cent. However, it will be noted that the prognosis seems to be better for those cases caused by previous surgery than those caused by other factors, as the mortality rate for the previous surgery group is 35 per cent, whereas the mortality rate for the other groups is 55 per cent, a difference of 20 per cent. A more detailed

study of surgery as an etiological factor is set forth in Table VI, where it is shown that there were a greater number of white female patients than male patients and a greater number of negro males than females susceptible to lung abscesses following these procedures.

TABLE III
RESULTS OBTAINED BY PHYSICIANS

Doctor	Total	C, Per Cent	I, Per Cent	U, Per Cent	D, Per Cent
Medical					
2	14	0.0	7.2	28.7	64.1
3	30	6.6	50.0	23.4	20.0
4	27	3.7	37.1	18.4	37.1
5	27	11.1	14.8	25.9	48.2
8	15	0.0	20.0	60.0	20.0
15	13	0.0	46.2	7.7	46.2
16	44	2.78	34.1	40.8	45.4
18	12	8.3	25.0	41.6	25.0
19	8	0.0	50.0	25.0	25.0
20	19	0.0	5.2	31.5	52.6
22	5	0.0	40.0	40.0	20.0
23	7	0.0	42.8	0.0	57.2
28	29	3.4	48.2	17.5	31.0
34	20	5.0	25.0	10.0	60.0
38	6	0.0	16.7	50.0	33.3
53	8	0.0	25.0	37.5	37.5
75	6	0.0	33.3	66.7	0.0
Surgeons					
26	28	3.5	17.7	47.8	35.7
36	21	9.52	9.52	14.5	66.6
Pediatricians					
43	10	0.0	40.0	10.0	50.0
44	15	0.0	20.0	13.3	66.7
47	7	0.0	57.2	0.0	42.8
48	9	0.0	44.4	33.3	22.2

The chances for improvement seemed to be greatest when abscess was caused by: (1) tonsillectomy, 51.8 per cent improved; (2) other surgery, 33.3 per cent improved; (3) foreign body, 33.3 per cent improved; (4) pneumonia, 29.2 per cent improved.

The following symptoms are stated in order of highest frequency as chief complaint: cough, 171; pain, 125; fever, 93; hemoptysis, 55; chills, 51; sputum, 41; loss of weight, 32; dyspnea, 22; nausea and vomiting, 21; diarrhea, 12; weakness, 12; headache, 8; and night sweats, 6.

TABLE IV
ETIOLOGY OF THE REPORTED CASES OF LUNG ABSCESSES

	C	I	U	D	Total
Pneumonia	1	16	8	29	55
Tonsillectomy	1	16	7	7	31
Other surgery	0	8	4	12	24
Influenza	0	8	1	2	11
Foreign bodies	1	2	2	1	6
Abortions	1	0	0	3	4
Furunculosis of face	0	0	0	3	3
Otitis media	0	1	0	3	4
Whooping cough	0	1	0	2	3
Peritonsillar abscess	1	0	0	1	2
Stab wounds	0	1	0	0	1
Fractured skull	0	0	1	0	1
Ameba	0	0	1	1	2
Gunshot	0	0	1	0	1
Tooth extractions	0	0	1	1	2
Face injury	0	1	0	0	1
Thrombophelebitis	0	0	0	1	1
Vincent's angina	0	0	0	1	1
Fractured rib	0	0	0	1	1
Spinal puncture	0	0	0	1	1
Tularemia	0	0	0	1	1
Gasolene inhalation	1	0	0	0	1

TABLE V
OUTSTANDING CONDITIONS PRECEDING ONSET OF LUNG ABSCESSES

Author	No. of Cases	Pneumonia, Per Cent	Upper Respiratory Infection, Per Cent	E.N.T. Surgery, Per Cent	Other Surgery, Per Cent	Unknown, Per Cent
Allen and Blackman	94	18	....	24	10	38
Rives	100	61.8	....	21.8		
Cutler and Gross, 1936	90	28	....	39	14	14
Leuth and Sutten, 1936	101	13	30	10	....	30
Warner, 1938	98	20	....	30	....	33
Freedman, 1938	276	38	26	10	15	
Fisher and Finny, 1938	88	40	9	15	13	10
Charity Hospital, 1941	417	13	2.6	7.9	6	67
Sweet, 1940	125	20	....	49.5	11.0	10.0
Jackson	124	....	37	29	10.5	
Morrison	66	....	....	39	13	

Tables VII, VIII, and IX deal with 250 cases of single lung abscesses designating

the affected side. It will be noted that the right side was affected twice as often as the left, 165 (66.0 per cent) were right-sided

TABLE VI
RESULTS OF LUNG ABSCESSES HAVING THE ETIOLOGY IN PREVIOUS SURGERY

	White				Colored				Total
	C	I	U	D	C	I	U	D	
Tonsillectomy	0	9	6	4	1	7	1	3	31
Amputation	0	0	0	2	0	0	0	0	2
Transurethral resection	0	0	0	3	0	0	0	1	4
Appendectomy	0	3	2	0	0	0	0	1	6
Ventral hernia	0	0	0	0	0	1	0	0	1
Plastic surgery	0	0	1	0	0	0	0	0	1
Herniplasty	0	0	0	0	0	1	0	2	3
Hysterectomy	0	0	0	0	0	0	0	1	1
Eye surgery	0	0	0	0	0	0	1	0	1
Sinus operation	0	0	0	1	0	0	0	0	1
Gastric resection	0	0	0	0	0	0	0	1	1
Exploratory laporatomy	0	0	0	1	0	0	0	0	1
Peritonsillar abscess	0	0	0	0	0	0	0	1	1
Total	0	12	9	11	1	9	2	10	54

TABLE VII
OCCURRENCE AND LOCATION OF SINGULAR ABSCESSES

	White		Colored		Total
	Male	Female	Male	Female	
Right Lung (165 or 66 per cent)					
Upper lobe	27	8	16	6	57
Mid lobe	16	7	6	1	30
Lower lobe	22	14	21	12	69
Not stated	..	..	..	..	9
	65	29	43	19	
Left Lung (85 or 34.0 per cent)					
Upper lobe	17	10	9	1	37
Lower lobe	18	10	13	4	45
Not stated	..	..	..	..	3
	35	20	22	5	

abscesses and eighty-five (34.0 per cent) were left-sided abscesses. The lower lobes, whether right or left, were more frequently involved than the upper lobes. Of the 250 (59.9 per cent) cases of single lung abscesses, 155 (61.3 per cent) occurred in

TABLE VIII
CLASSIFICATION AS TO RACE, SEX AND OUTCOME IN SINGULAR, RIGHT LUNG ABSCESSES

	C	I	U	D	Total
White					
Upper	0	12	5	18	35
Mid	1	13	5	4	23
Lower	1	17	9	9	36
Undetermined	0	0	3	0	3
Total	2	42	22	31	97
Colored					
Upper	1	8	5	8	22
Mid	0	1	0	6	7
Lower	0	13	7	13	33
Undetermined	0	2	2	2	6
Total	1	24	14	29	68

TABLE IX
CLASSIFICATION AS TO RACE, SEX AND OUTCOME IN SINGULAR, LEFT LUNG ABSCESSES

	C	I	U	D	Total
White					
Upper	1	15	5	6	27
Lower	1	9	14	4	28
Not stated	0	1	0	0	1
Total	2	25	19	10	56
Colored					
Upper	0	3	1	6	10
Lower	1	5	2	9	17
Not stated	0	0	0	2	2
Total	1	8	3	17	29

white admissions and ninety-seven (59.1 per cent) in negro admissions. There were ninety-seven (62.5 per cent) white patients and sixty-eight (70.0 per cent) negro patients with single abscesses on the right side. There were fifty-six (36.3 per cent) white patients and twenty-nine (29.8 per

cent) negro patients with left-sided abscesses. Of the patients with right-sided abscesses, there were thirty-one (31.9 per cent) deaths in the white group and twenty-nine (42.7 per cent) deaths in the negro group. The mortality rate for patients with left-sided abscesses was 17.8 per cent in the white group and 58.7 per cent in the negro group. The mortality rate for abscesses on the right side was approximately the same in both races, whereas, on the left side it was 40.9 per cent higher in the negro group, however, the death rate in all cases was higher in this group.

multiple unilateral abscesses. Multiple abscesses occurred in seventy-six (29.9 per cent) of the total white admissions and in sixty-two (38.8 per cent) of the total negro admissions. It becomes apparent that the percentage of multiple abscesses is higher in negro admissions. There were fifty (65.9 per cent) white patients and fifty (80.7 per cent) negro patients who died from multiple lung abscesses.

Table XIII contrasts mortality rate in multiple and single abscesses. This shows that there were eighty-seven deaths in single lung abscess cases with forty-one (49.3 per cent) occurring in the white ad-

TABLE X

LOCATION OF SINGULAR LUNG ABSCESSES

Author	Right Lung			Left Lung		Total
	U	M	L	U	L	
Fisher	21 (35.6%)	11 (18.6%)	14 (23.7%)	14 (23.7%)	19 (32.2%)	59
Cutler	23 (25.5%)	5 (5.5%)	21 (23.5%)	20 (22.2%)	16 (17.7%)	90
Allen	14 (14.0%)	18 (18.0%)	30 (30.0%)	13 (13.0%)	23 (23.0%)	100
Kline	22 (21.7%)	10 (9.9%)	28 (27.7%)	13 (12.8%)	28 (27.7%)	101
Geay	16 (39.0%)	1 (2.4%)	7 (17.0%)	10 (24.4%)	7 (17.1%)	41
Freedman*	47 (16.3%)	28 (9.7%)	110 (38.1%)	36 (12.4%)	68 (23.8%)	289
Charity Hospital	57 (23.9%)	30 (12.6%)	69 (28.9%)	37 (15.5%)	45 (18.9%)	238

* Includes single and multiple abscesses.

Considering Table X which contrasts the location of single lung abscesses in the findings of several authors, only one group of statistics showed the medial lobe to be involved more frequently than the upper lobe. In three groups the upper lobe was involved more frequently than the lower lobe on the right side. However, on the left, two of three authors reported the upper lobe more frequently involved than the lower lobe. As illustrated by Table XI, the reports of these authors show no uniform distribution between death rates and lobe involved. If some constant factor could be found in this group, one could give a prognosis.

Table XII shows that of the total admissions 138 (33.0 per cent) had multiple lung abscesses, that is, either bilateral or

missions and forty-six (45.5 per cent) in the negro admissions; similarly there were 100 deaths in multiple abscesses, 50 per cent occurring in the white admissions and 50 per cent occurring in the negro admissions. The percentage of deaths in races is substantially the same in both single and multiple abscesses. These figures are quite different from Reves' report of 88 per cent mortality in bilateral abscesses and 67 per cent in unilateral multiple abscesses.

Table XIV demonstrates the outcome when empyema occurred as a complication. The mortality rate was 81.5 per cent. This is twice the death rate for the entire series. However, Neuhof stated that when empyema occurred as a complication of the one-stage treatment of lung abscesses it did not enhance the mortality rate,

whereas, this study shows that the mortality rate is twice that of the entire series.

It is of interest to note the outcome of those patients who were admitted either to a surgical service or a medical service and received attention only from the physicians of those respective services as compared with those who received simultaneous attention from both. Table xv shows the results in 417 cases of which 276 patients received medical treatment with a mortality rate of 51.0 per cent; eighty-six received surgical treatment with a 48.8 per cent mortality rate; and fifty-five received combined treatment with a 40.0 per cent mortality rate. This reveals that the mortality in surgical-medical care was approximately 10 per cent less than independent care; however, the percentage of unimproved cases is greater in surgical-medical care. The 10 per cent improvement loses its value when one considers the size of the sampling in the three contrasted groups.

Considering the fact that this group of statistics does not contain the follow up results that are found in the majority of other similar studies, the following comparisons are not entirely justified. As to

TABLE XI
IMPROVED AND MORTALITY RATES IN LOBES INVOLVED

Author	U		M		L	
	I	D	I	D	I	D
Right Lung						
Geay	12	2 (14.3%)	1	1 (50.0%)	4	4 (50.0%)
Cutler	13	10 (43.5%)	2	3 (60.0%)	14	7 (33.3%)
Allen	7	4 (36.3%)	14	4 (22.2%)	18	9 (33.3%)
Charity Hospital	21	26 (55.3%)	15	10 (40.0%)	22	12 (35.2%)
Left Lung						
Geay	6	3 (33.3%)	..	.....	7	4 (36.3%)
Cutler	14	6 (30.0%)	..	.....	6	10 (62.5%)
Allen	9	4 (30.7%)	..	.....	13	8 (38.0%)
Charity Hospital	12	17 (58.6%)	..	.....	16	13 (44.8%)

TABLE XII
CLASSIFICATION AS TO RACE, SEX AND OUTCOME IN MULTIPLE LUNG ABSCESSES

	C	I	U	D	Total
White 76 or (29.9%)					
Right 26 or 34.3%	1	6	11	8	26
Left 11 or 14.5%	0	3	3	5	11
Bi-lat. 28 or 36.9%	0	1	0	27	28
Mil. 8 or 15.0%	0	0	0	8	8
Not stated 3 or 3.9%	0	1	0	2	3
Total	1 (1.3%)	11 (14.4%)	14 (18.4%)	50 (65.8%)	76
Colored 62 or 38.8%					
Right 26 or 41.9%	0	5	3	18	26
Left 14 or 24.5%	0	1	3	10	14
Bi-lat. 17 or 27.4%	0	0	0	17	17
Mil. 4 or 6.6%	0	0	0	4	4
Not stated 1 or 1.6%	0	0	0	1	1
Total	0	6 (9.7%)	6 (9.7%)	50 (80.6%)	62

TABLE XIII
MORTALITY RATE IN MULTIPLE AND SINGLE LUNG ABSCESSES

	White	Colored	Total
Multiple abscesses	50 (50%)	50 (50%)	100
Singular abscesses	41 (49.3%)	46 (45.5%)	87

TABLE XIV
OUTCOME IN EMPYEMA

	C	I	U	D	Total
White	1	4	1	18	24
Colored	0	1	1	17	19
Total	1	5	2	35	43

TABLE XV
COMPARISON OF TREATMENT

Treatment	C	I	U	D	Total
Surgical	3 (3.5%)	30 (34.8%)	11 (12.7%)	42 (48.8%)	86
Surgical medical	1 (1.8%)	19 (34.5%)	13 (23.6%)	22 (40.0%)	55
Medical	8 (2.8%)	80 (29.3%)	47 (17.0%)	141 (51.0%)	276
					417

race, no other series contains as large a proportion of negro patients as this one. In Lueth's collection of 101 cases, eighteen (16.3 per cent) cases occurred in negroes as contrasted to 169 (38.8 per cent) in this series.

Table XVI
COMPARATIVE DEATH RATES OF LUNG ABSCESSES

Author	No. Cases	Died	Per-centage
Lueth	101	40	39.6
Kline	90	40	44.5
Fisher	88	21	23.8
Warner	98	21	21.4
Allen	100	40	40.0
Cutler	90	32	35.5
Neuhof	45	2	4.4
Charity Hospital	417	205	49.1

The percentages of deaths in eight of the more recent statistics are given in Table XVI. Excluding Neuhof's group, the rest of the reports fall into the same category as to percentage of deaths, ranging from 21.4 to 49.1 per cent.

More recently the morbidity and mortality rates have been diminished by surgeons now capable of carrying out more difficult procedures such as lobectomy or pneumonectomy. Lindskog has verified this in a report of six cases, four being primary lobectomies and two secondary lobectomies following cautery pneumonotomy, all of which were cured. This procedure would seem to be more rational than any other after considering the pathological condition we are dealing with. In these abscessed lungs there is a marked walling off of the infected area to such an extent that even after the evacuation of the cavity there is failure of collapse of the wall. Also, there is a great deal of bronchiectasis in the surrounding bronchi which will continue to act as a foci of infection, thus making the eradication of the cavity impossible under the more conservative procedures. Therefore, it seems apparent that no other procedures, excepting lobectomy and pneumonectomy, could efficiently and satisfactorily eliminate the entire pathological process and thus insure the individual of complete recovery.

Table XVII
VARIOUS TYPES OF THERAPY AND RESULTS

	C	I	U	D	Total
Neoarsphenamine	0	31	11	23 (35.4%)	65
Bismuth	1	1	1	2 (40.0%)	5
Neoarsphenamine and bismuth	2	7	3	6 (33.3%)	18
Sulfanilamide	2	9	2	11 (45.8%)	24
Sulfapyridine	2	2	3	17 (70.8%)	24
Sulfathiazole	0	1	1	3 (60.0%)	5
X-ray	1	1	0	4 (66.6%)	6
Transfusion	0	16	6	33 (60.0%)	55
Emetine	0	7	0	3 (30.0%)	10
Lipiodol	1	12	16	11 (27.5%)	40
Bronchoscopy	0	13	12	7 (21.9%)	32
Foreign protein	0	2	2	5 (55.5%)	9

The medical treatments rendered these patients were numerous and those methods in which five or more trials were attempted are included in Table XVII. Lipiodol was included as a therapeutic measure because in some instances it was used in an attempt to sterilize the cavity. There were fifty-three patients receiving one of the sulfanilamide groups, of them, thirty-one (58.6 per cent) died. This is a relatively small group and the drug was administered in small doses. Of the eighty-two patients receiving neoarsphenamine or neoarsphenamine and bismuth in combination, twenty-nine (34.2 per cent) died. There were ten patients treated with emetine, of which,

Table XVIII
TYPES OF SURGICAL PROCEDURES AND RESULTS OBTAINED

	C	I	U	D	Total
Thoracotomy	1	0	0	3	4
Rib resection one and two-stage	0	12	2	12	26
Thorocoplasty	1	0	0	0	1
Thorococentesis wet and dry	1	8	2	15	26
Artificial pneumothorax	0	6	3	8	17
Phrenicoecersis	0	4	4	4	12
Total	3	30	11	42	86

two were demonstrated to actually have had ameba histolytica. One of them died. Bronchoscopic examinations were carried out by twenty-three surgeons and only two reported success in getting into the cavity.

There were eighty-six patients subjected to some surgical procedure, of these, forty-two (48.9 per cent) died, which is practically the same total mortality as that of the entire series. In Table XVIII the various surgical procedures are outlined. There are twenty-six patients in whom rib resections were done, twelve (46.2 per cent) of whom died. This compares most unfavorably with Neuhof's report of 4.4 per cent mortality rate, the principal difference being that Neuhof applied a one or two-stage procedure as soon as he was certain of the type of disorder he was dealing with, whereas, it was done in this series as a last resort. Thoracentesis was done, and in many of these cases it was entirely unjustifiable because of negative *x*-ray reports, negative physical findings, and no presence of fluid on attempted aspiration. Artificial pneumothorax was attempted in seventeen cases, and in only six could an improvement be demonstrated. In eight of these cases empyeme followed its usage.

Table XIX denotes the comparative mortality rates in surgical procedures as done in several institutions. There are no uniform findings among the procedures outlined, the mortality rate in rib resection varying from 4.5 to 57.0 per cent, phrenic nerve procedures varying from 1.1 to 100 per cent, artificial pneumothorax varying from 26.9 to 100 per cent. There were no constant findings to indicate the preference of one procedure over another, excepting Neuhof's use of rib resection, nor is there an indication that any one group applied the most suitable procedure.

It will be noted that 113 of the 417 patients admitted had previously been treated at the Charity Hospital, and the results are presented below:

TABLE XIX

COMPARATIVE MORTALITY RATES IN SURGICAL PROCEDURES ARE CONTRASTED WITH RESULTS FROM OTHER INSTITUTIONS

Procedure	Leuth	Cutler	Allen	Sweet	Charity Hospital	Neuhof
Thoracoplasty	66%					
Artificial pneumothorax	100%	.....	26.9%	.....	47.0%	
Thoracocentesis	60%	.....	.....	24.6%	57.8%	
Phrenic nerve procedures	25%	100%	3.9%	.....	1.1%	
Rib resection	57%	42.5%	27.7%	41.1%	25.0%	4.5%

White				Colored			
C	I	U	D	C	I	U	D
0	23	56	7	0	8	12	7

The mortality rate in this group of patients was 12.4 per cent which was one-fourth the general mortality rate.

In this paper are presented the results of 417 cases of lung abscesses in respect to number, location, race, sex, and age distribution with the comparative findings of other investigators.

Forty-nine per cent mortality rate offers very little encouragement for the efforts put forth by the physicians that were in attendance with patients having lung abscesses at Charity Hospital in New Orleans. This inference can be drawn from the survey of this paper, that the methods of treatment employed during the period of time from 1931 to 1941, regardless of which

one used at this institution, did not render satisfactory results.

SUMMARY

It was found in the review of 417 cases of lung abscesses that 268 occurred among white patients and 169 among negro patients, and that the majority of the patients were between thirty and fifty years of age. Of these cases, only twelve patients can be said to have been completely cured, and 205 (49.2 per cent) died. A greater mortality rate existed in the negro race. Multiplicity of abscesses and empyema seemed to increase the mortality rate.

Surgery and lung infections were equally contributory to the formation of lung abscesses which is quite contradictory to many similar reports which present surgery, especially that of the upper respiratory tract, as the outstanding etiological factor. The chances for recovery seem to be better in cases resulting from previous surgery rather than those resulting from infectious causes.

When surgical procedures were used in an effort to eradicate the abscess the mortality rate was 48.9 per cent. The medical treatments administered proved to be just as unsatisfactory, and one cannot state which yielded the best results.

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CONGENITAL HEMOLYTIC ICTERUS*

SURGICAL TREATMENT OF COMPLICATIONS WITH A REPORT OF TWO CASES

ELWOOD O. HORNE, M.D.
Surgeon, Worcester City Hospital
WORCESTER, MASSACHUSETTS

THE spleen still richly deserves the designation applied to it by Galen, "An organ full of mystery." Even though it has been said that spleens were removed by the ancients to increase the wind of runners and from then on an occasional operation was done following bayonet and other wounds, it has been in the past fifteen years and more especially in the past ten that there has been great interest and progress in the development of the knowledge of diseases involving this organ.

The marked confusion of the anemias and other conditions associated with disturbances of the spleen that were obtained only a few years ago is rapidly being clarified and the diagnostic characteristics are constantly becoming more definite. Nevertheless, there are still many points in the treatment of hemolytic icterus and its associated complications that need study. Although there are numerous complications encountered such as the development of platelet crises (1), anemia, cholecystitis and cholelithiasis, optic atrophy, etc., my discussion hereafter will be limited to certain aspects of the disease that would be of interest to the surgeon operating upon these patients with particular emphasis on the treatment of hemolytic icterus complicated by cholecystitis and cholelithiasis.

HISTORICAL REFERENCES TO SPLENECTOMY

In Pliny's Natural History the first positive statement about removal of the spleen is made. Even as far back as the year 1680 splenectomy was successfully carried out on the dog by Zambeccari.[2] According to Moynihan,[3] the first splenectomy for hemolytic jaundice was done by Sir Spencer Wells[4] in 1887, and as reported by Lord Dawson[5] the patient was alive and well twenty seven years after operation and that her red blood cells still showed increased fragility. The second reported operation was done by Bland Sutton[6] in 1895. From the accounts of these cases the diagnosis seems to have been fitted later to the original description and subsequent course. Wilson[7] described hemolytic jaundice in 1890 as congenital jaundice associated with splenomegaly, but probably the first case diagnosed as hemolytic jaundice for which splenectomy was recommended was the one done by Banti[8] in 1903 and reported in 1912. Attention was first called to this disease in this country in 1910 by Griffin,[9] and since then there have been an ever increasing number of reports especially from the larger clinics.

ETIOLOGY AND CLASSIFICATION

The actual cause of the disease is unknown and the primary cause is evidently considered not to be in the spleen. There are two types described, the familial and acquired. According to Muelengracht[10] the familial type is inherited as a dominant factor while Haden[11] favors the hypothesis that in the familial type the microspherical red blood cells of increased fragility are inherited and thus more readily destroyed in the spleen resulting in hypertrophy of that viscus. Dawson, Lee and Palmer believe that the two types are the same. Watson[13] has determined that the most significant factor in distinguishing the familial or congenital from the secondary or acquired types to be the predominance

* From the East and West Surgical Services of the Worcester City Hospital. Dr. Horne is now a Captain with the Medical Corps of the U. S. Army.

of microcytes in the former and macrocytes in the latter. This distinction should depend on the measurement of the average diameter of the erythrocytes and not on simple inspection of the blood smears. Nesler[14] believes that the congenital and acquired forms differ at the time of onset, and in general the course of the acquired form is more severe. Wise[15] concluded that the acquired group of cases as so classified would in time be omitted and all cases recognized as congenital. In many patients there is no change in the fragility of the cells after splenectomy although the jaundice disappears, which is against the theory that hemolytic jaundice is a primary disease of the spleen. Most authorities[16,11] consider the disease to be an hereditary disorder of the red cell formation in the bone marrow with the production of small thick erythrocytes (spherocytes) as the salient feature. Dameshek[17] has advanced the concept that hemolytic jaundice is caused not by an intrinsic defect in the bone marrow, but rather by the action of hemolysins of various types and in varying "doses" on mature red blood cells.

SIGNS, SYMPTOMS AND LABORATORY FINDINGS

The cardinal symptoms and signs of hemolytic jaundice, viz., acholuric jaundice, enlarged spleen, anemia, crises with pain and fever, increased fragility of the red cells, increased reticular cells, urobilin but not bilirubin in the urine, normal colored stools, increased icteric index, negative Van den Bergh reaction, and the absence of itching, are now well established; and although the diagnosis may at times be difficult, it can usually be made with reasonable certainty.

The blood yields the most important data of which the Bibierre or fragility test is diagnostic of the disease. The red cells as discovered by Chauffard,[18] show a diminution of resistance to hemolysis by hypotonic salt solution, that is an increased fragility. Normal hemolysis begins at 0.42 per cent and is complete at 0.32 per cent.

There is a secondary anemia which is likely to be more severe in women.[19] The degree depends upon the efficiency of the hemopoetic system.[20] It is chronic and usually moderate although during a crisis the hemolysis may reduce the number of red cells markedly. The color index is high but less than one. The number of white cells is normal but may be increased during and after a crisis. The differential count is unaltered but the red cells show anisocytosis with a predominance of microcytes. Evidence of blood regeneration is shown by an increase in the reticulocyte count.

A positive indirect Van den Bergh reaction is present as a rule, but a direct reaction may be obtained when there is associated disease of the bile ducts. The icteric index of the blood serum is increased and the serum usually contains urobilin. The Wassermann test may occasionally be strongly positive when no other evidence of syphilis is present. The test becomes negative after splenectomy and manifestations of lues do not develop subsequently.[21]

The urine contains urobilin, indicative of functional inadequacy of the liver cell. It does not contain bile. The stools are normal in color in the absence of complications and contain increased amounts of urobilin. The values of urobilin and urobilinogen in the duodenal contents, as determined by the Schneider test, are increased. This is an index of the blood destruction at a given time.[22]

Roentgenograms may reveal an enlarged heart, a delay in the formation of the centers of ossification and a widening of the bones with a thin cortex due to hypertrophy of the marrow tissue in its effort to keep up maximum erythrocyte production. The expansion of the medullary substance at the expense of the cortical bone is an observation characteristic of the congenital anemias in childhood.[23]

TREATMENT

It seems to be well established that the treatment of hemolytic jaundice is defi-

nitely surgical and consists of removal of the enlarged spleen. The experience of most surgeons justifies the statement that splenectomy can be done at quite early ages. Taylor,[24] in England, has reported splenectomy in children nine, eleven and thirteen months of age. Bell's[25] patient, aged fifteen months, is probably the youngest reported in America. Our youngest patient had a splenectomy at the age of four. Diamond[26] at the Childrens Hospital, in Boston, advocates early splenectomy for the infant or child with congenital hemolytic icterus. He reminds us of the fact that as the child passes through succeeding attacks of hemolysis, jaundice and anemia, there appears evidence of disturbance in function of organs other than the hemopoetic system as may be illustrated by the development of cholelithiasis at a later date.

The operative mortality is exceptionally low, especially in competent hands. Pemberton's[27] series from the Mayo Clinic, composed of 118 cases, shows a hospital mortality of 3.4 per cent. He has noted a decisive affection of the liver on the operative mortality and subsequent longevity. When the liver was affected the mortality was 5.4 per cent, and 80 per cent of the patients were living at the time this observation was made (1931). In the presence of a normal liver the mortality was 1.6 per cent and 90 per cent of the patients were living. He also reported that 86 per cent of the patients who survived the operation were living and 83 per cent in good health.

Following operation the jaundice and anemia usually improve progressively. It is noted that the fragility of the red cells in practically all cases remains greater than normal. Among clinicians there is almost universal agreement that gradual improvement in the red cell level follows splenectomy for hemolytic jaundice. The striking suddenness with which such changes occur was pointed out first by Glover and Fargo[23–28] and later by Doan[29] and his associates. In a few instances following operation the jaundice has recurred after several years, but it may be stated that, as a rule, the effect of splenectomy in hemolytic jaundice is permanent. However, the danger attributing a recurrence of jaundice to hemolytic icterus when it may be due to gallstones, or some biliary tract disease, must be clearly borne in mind. Too frequently this point is overlooked especially by the general practitioner and internist, who is more apt to see these patients when a recurrent jaundice occurs. Without doubt there is brought to our attention an occasional case of hemolytic jaundice with recurrent jaundice, abdominal pain and splenomegaly. Many of these patients have never had an investigation of their biliary tract. If only a simple Graham test were done, it might prove the gallbladder to be the seat of the trouble.

Although known by most surgeons very little attention has been focused on the importance of remembering that about 60 per cent of the long standing cases of hemolytic icterus have associated gallstones which may produce an obstructive jaundice resulting in the group of symptoms usually associated with this condition, including a direct Van den Bergh reaction. Diamond[26,31] encountered the presence of gallstones in two cases in a review of twenty-five cases of hemolytic jaundice in children. Frequently in childhood many cases of hemolytic jaundice with associated gallstones are not operated upon until they have suffered from continued hyperbilirubinemia which often leads to the production of gallstones and subsequent drainage from biliary obstruction.

In searching through available literature I found it relatively free of articles reporting cases or presenting emphasis on the importance of an associated cholilithiasis in hemolytic icterus.

Owen and North[32] have remarked that when disease is present in two organs simultaneously attention is apt to be centered upon that viscus which gives rise to the more conspicuous symptoms. Thus in coexistent cholilithiasis and hemolytic icterus, the associated and often symptomless gall-

bladder disease may be overlooked. This co-existence has been marked by numerous authors (Boyd, Balfour, Pool[33]). Donovan has noted that 60 per cent of the cases of hemolytic jaundice show pigment stones and suffer from attacks simulating biliary colic. Hence it is rather easy to understand why these patients have been operated upon for jaundice due to gallstones. Walton[34] is of the opinion that patients with hemolytic jaundice are born with red blood corpuscles which are above normal in shape and especially in fragility. Thus they are destroyed by the spleen so that jaundice and a profound secondary anemia develops. Owing to the increase in pigment in the blood stream, gallstones of the pigment type are almost certain to develop. Pemberton[27,35] in a review of the Mayo Clinic series of splenectomies for hemolytic jaundice, observed conclusive evidence of gallbladder disease with or without stones, in 69 per cent. In spite of this the advice of Moynihan[3,36] is not often followed by operating surgeons that "no operation for hemolytic icterus is complete until the bile passages have been thoroughly explored. Where both diseases are found, a rational treatment would seem to be splenectomy and cholecystectomy, in either one or two operations."

Wise,[15,37] in 1933, reported six cases of congenital hemolytic jaundice, five in one family, but made note of an associated cholilithiasis in one case only. In our experience at the Worcester City Hospital the presence of gallstones in hemolytic jaundice is much more frequent than the literature would seem to indicate. In a review of nine cases of hemolytic icterus of which five were subjected to splenectomy, seven were found to have associated gallstones. In the other two cases no reference was made to the presence or absence of stones although both patients had symptoms of cholecystitis with cholilithiasis. It is of interest to observe that of three cases occurring in one family, a father and two daughters, all had associated biliary tract disease. Both girls had submitted to splenectomy and cholecystectomy at different operations with very successful recoveries. The father refused operation but is still admitted to the hospital periodically suffering from splenomegaly, jaundice and upper abdominal pain.

Whether or not to perform the operation of cholecystectomy at the time of splenectomy should depend upon the judgment of the surgeon. Brooks and Clinton[38] reported a successful splenectomy and cholecystectomy at one sitting; the patient was a boy, four years of age. No reference was made as to the reason for simple drainage rather than removal of the gallbladder but it is probably true that at the age of four cholecystostomy would prove to be the wisest procedure. However, it is well known that these cases, especially children, may continue to reform stones from a continued hyperbilirubinemia, and may even drain stones through the cholecystostomy sinus. This is the type of case which I believe should be subjected at a later date to cholecystectomy if in the opinion of the surgeon the patient's condition justifies a second operation. A close follow-up is frequently overlooked, and once the patient leaves the hospital he often makes no further effort to return unless he has a recurrence of symptoms. Hence it should be impressed upon these patients that cholecystostomy is only a temporary procedure and does not offer a permanent cure. As is illustrated by our report Case 11, the operation of choice was removal and not simple drainage of the gallbladder, to be performed by those trained in the technic of biliary surgery.

Owen and North[32] have reported two cases with co-existent cholelithiasis and hemolytic jaundice. In each case splenectomy and cholecystectomy were performed. In one instance the operation was performed in two stages; in the other, the operation was accomplished in one stage. Without doubt whenever possible the one-stage operation is to be preferred, but if not possible a two-stage operation is essential to the continued welfare of the patient.

As is reported in one of our cases perforation of the gallbladder sinus is extremely rare. To be sure perforation of the gallbladder itself is unusual, it being comparable to perforation of any other viscus. Judd[39] at the Mayo Clinic, in reviewing the cases of acute cholecystitis in which operation had been performed, found sixty-one in which the gallbladder had perforated. In only two of those was there extravasation of the contents into the general peritoneal cavity and one died. Eight of their patients had undergone cholecystostomy; there were six deaths in the entire series, half were associated with pulmonary complications. In the treatment of perforation with ensuing general peritonitis immediate surgical intervention is imperative. Rupture through the abdominal wall was observed in two cases, in both of which previous operations on the gallbladder had been performed. In these cases probably the viscus had been sutured to the abdominal wall at the time of the previous procedure or had become adherent in the scar.

Even in so large a group as that of the Mayo Clinic in no instance was there any note made of a perforated sinus tract following cholecystostomy with ensuing general biliary peritonitis. This type of rupture is extremely rare and worthy of reporting. Eliason[40] found nine perforations in 490 biliary admissions in a space of eleven years but no mention was made of a perforated cholecystostomy sinus tract.

Although calculous cholecystitis is encountered in the female patient many times more frequently than in the male, perforation of the gallbladder occurs in a higher relative proportion of male cases. Preoperative diagnosis is unusual as is shown by a review of the literature of the reported cases. In those cases in which there was widespread soiling of the peritoneum without localization of the lesion, diagnosis of perforated ulcer, ruptured appendix, and diffuse peritonitis of undetermined origin have been frequently made. Mitchell[41] states that before operation a correct diagnosis is made in only one out of sixteen cases. If the patient has previously been subjected to a biliary tract operation, the cause of the peritonitis would probably be more definite, especially if the type of operation had been that of drainage instead of removal. Realizing that perforation of the gallbladder is unusual but not the rare catastrophe it was once considered to be, more emphasis may justly be placed upon the necessity of urging all patients with attacks of recurrent calculous cholecystitis to submit to cholecystectomy while their gallbladder is quiescent. Delay on the part of both the patient and attending physician probably is responsible for the loss of many patients with this complication each year. In hemolytic icterus complicated by associated biliary tract disease the removal of delay in treatment is just as important as though both diseases were not co-existent.

Harkins[42] concludes that rapid death in biliary peritonitis is due to shock, a fall in blood pressure and blood volume and a decrease in blood concentration. Mentzer[43] believes that sterile bile is not the cause of death but that it is due to pyogenic rather than chemical peritonitis when it occurs. Ravdin[44] is of the opinion that in bile peritonitis there must be an opening and direct communication with the biliary passages.

COMMENT

In two cases reported herein, splenomegaly and jaundice were present together with cholelithiasis. Each case was in the younger age group, yet the presence of gallstones was an ever prominent factor in their symptomatology. In the first case reported splenectomy and cholecystectomy were performed in two stages with a successful recovery; in the second case splenectomy and cholecystostomy were accomplished in two stages, thirteen years apart, followed by a rupture of the cholecystostomy sinus into the general peritoneal cavity with resultant biliary peritonitis and death. Had the second patient submitted to cholecystectomy between the time of the

first and second operations, or had a cholecystectomy rather than cholecystostomy been performed at the time of the second operation, the end result would in all probability proved to have been more favorable.

CASE REPORTS

Case I. M. C., a white female, aged sixteen years, was admitted to the Worcester City Hospital April 20, 1940, with a chief complaint of right upper quadrant pain of three months' duration. She had had measles and mumps as a child and no other serious illnesses. She was jaundiced at birth. Tonsils and adenoids were removed at the age of fourteen. Her menstrual history was normal. Her mother died at the age of twenty-one, cause unknown. Her father was living and well. He had periodic bouts of jaundice but otherwise was well.

The present illness dated back to birth at which time the patient was jaundiced, the jaundice having been present ever since, remaining approximately the same with minor variations in intensity at different intervals. It was definitely aggravated by intercurrent infections. Exclusive of spells of nausea, which were exaggerated whenever the jaundice became intense, the patient felt quite well until January, 1939, at which time she was admitted to the hospital complaining of abdominal pain of six months' duration. The diagnosis was cholecystitis with cholelithiasis, familial hemolytic jaundice.

After a considerable work-up the patient was subjected to splenectomy, and at operation after removing the spleen the gallbladder was palpated and found to contain a large stone in the ampulla. Presumably the patient's condition did not warrant further surgery and no biliary procedure was attempted. The patient's postoperative course was rather stormy with complications of wound sepsis, pneumonia and empyema of the left chest. Hemolytic streptococci were isolated from the chest fluid. Closed drainage was required followed by rib resection. The patient finally recovered after a hospital stay of almost four months. She felt fairly well until April, 1940, three months before entry for her present admission when she complained of attacks of right upper quadrant pain which have become more frequent keeping her awake at night. There was no jaundice or vomiting. Her bowels were regular and she was referred to the hospital for study and possible cholecystectomy.

Physical examination revealed a well developed and nourished young girl, in no acute distress. Temperature 99°F.; pulse 90; respirations 20. The essential findings were: moderate tenderness in the right upper quadrant, some spasm but no masses. Old splenectomy and thoracotomy scars were well healed.

Laboratory studies revealed: Hemoglobin 96 per cent; red blood count 5,160,000, white blood count 17,400 with 54 per cent polymorphonuclears, 39 per cent lymphocytes, reticulocytes 1.5 per cent; icteric index 15; red blood cell fragility .44–.42; Van den Bergh-slightly positive-direct delayed; urine and blood chemistry normal.

The Graham test showed loss of gallbladder function with one calculus present. The patient was given seven days of preoperative preparation.

Cholecystectomy was performed with drainage. The abdomen was opened through a high right rectus muscle splitting incision. The liver was normal; the gallbladder was found to be covered with numerous thin adhesions and to contain one large calculus. Common and cystic ducts were patent. There were no stones and the gallbladder was removed without difficulty.

The patient was returned to ward in good condition. Convalescence was uneventful with very satisfactory recovery and she was discharged on the fifteenth postoperative day.

Eight months later the patient had fully recovered and had no complaints. She works as a waitress every day and feels fine. Recent blood counts are within normal limits.

Comment. This case serves to illustrate the point that a successful result can be obtained by adequate surgery on a patient with hemolytic jaundice and co-existent cholelithiasis. In this particular patient both splenectomy and cholecystectomy were performed at two different operations. The existence of an associated disease (gallstones) was recognized at the time of the splenectomy and a successful cholecystectomy was performed at a later date.

Case II. A. C., a white male, aged seventeen years, was admitted to the Worcester City Hospital February 23, 1940, complaining of

generalized abdominal pain of thirty hours' duration; he had a draining post-cholecystostomy sinus of six months' duration and died February 26, 1940.

The patient had been a full term, spontaneous delivery at birth and had no noticeable icterus at birth. He suffered from no infectious diseases except measles at the age of three. He developed jaundice and an enlarged spleen at the age of four, at which time a diagnosis of congenital hemolytic icterus was made and a splenectomy performed. He was discharged improved but not cured. His reticulocytes were between 70 and 90 per cent. His fragility tests were at the upper limits of normal—0.05 per cent to 0.36. The red blood count was 3,000,000 to 2,700,000. His icteric index was of course increased. He evidently recovered satisfactorily and enjoyed fairly good health thereafter until his present illness, having had no further remissions.

His father was living and well, aged fifty-seven; his mother had died at the age of thirty, cause unknown. One brother died in infancy. Two male siblings were living and well. There was no jaundice or bleeding tendency in any family member and no other familial diseases.

About six months before entry the patient developed jaundice, vomiting and right upper quadrant pain. He was seen by a physician who stated that he had an acute cholecystitis and thence was referred to the hospital where a cholecystostomy was performed. Numerous small stones were removed from the gallbladder at operation. His general postoperative convalescence was slow but uneventful. However, through his cholecystostomy sinus he passed numerous small stones and he continued to drain bile up until six days before his present entry. His jaundice had disappeared. About twenty-four hours before admission the patient suddenly complained of severe right upper quadrant pain with radiation to the right shoulder followed in a few hours with radiation to the right lower quadrant and later becoming generalized over the entire abdomen. There was no history of vomiting but the patient stated that his urine had been dark for two days. His stools were brown. Showing no improvement at home he was referred to the hospital. Upon entry the sinus was draining bile and one day following he was jaundiced.

Physical examination revealed an acutely ill patient with a temperature of 102°F., pulse 140, respiration 36. The essential findings were: (1) sclera and skin were moderately icteric; (2) bronchovesicular breathing at the right base, no râles; (3) a small amount of stained fluid (bile) draining from the old cholecystostomy sinus opening; (4) definite spasm and tenderness to palpation over the entire abdomen, more pronounced over the right upper and lower quadrants. Laboratory studies revealed: hemoglobin 54 per cent (S); red blood count 3,800,000 two nucleated red blood cells per 100 white blood cells; white blood count 73,400 with 79 per cent polymorphonuclears, lymphocytes 5 per cent, non-segmented cells 10 per cent; hypochromia 2 plus, stippling 2 plus, polychormatophylia 1 plus, reticulocytes 12 per cent. The urine was slightly colored, bile 2 plus, sediment negative. Icteric index was 38. *X*-ray of the chest showed a spotty and cloudy infiltration in the right lung consistent with early pneumonia.

A diagnosis of rupture of the gallbladder or perforation of the cholecystostomy sinus tract with resultant biliary peritonitis was made. The patient was given intravenous 5 per cent glucose and saline solution and a blood transfusion in an attempt to improve his general condition. While lying in bed the patient appeared to have a considerable amount of respiratory embarrassment. The sinus tract opened up spontaneously a few hours after admission and drained a copious amount of bile and the patient felt markedly improved thereafter.

Exploratory laparotomy was performed under local and gas-oxygen anesthesia. The abdomen was opened through a mid-right rectus paramedian incision with removal of approximately two gallons of bile stained fluid. The loops of small bowel were adherent throughout and numerous adhesions were noted covering the area about the gallbladder. It was apparent that the patient's condition was extremely poor on the operating table and no further surgery could be accomplished. Two drains were inserted in the right lateral gutter for drainage. Culture was obtained of the peritoneal fluid.

The patient returned to the ward in poor condition. He was placed on the danger list and given further intravenous therapy. The pathological examination of the peritoneal fluid revealed the organisms to be Staphylococcus aureus and Bacillus pyocyaneus. The patient's condition, pulse and temperature rose steadily and his temperature to 106°F. He became quite

toxic and expired on the second postoperative day. An autopsy was obtained.

At postmortem examination a fistula from the distal end of the gallbladder to the skin surface was found. About 2 cm. from the skin surface of the fistula was another sinus leading to the anterior and superior surface of the liver. This sinus was the source of the bile in the peritoneal cavity. The common and cystic ducts were patent. Numerous stones were found in the gallbladder, none in the ducts. Anatomical diagnosis: Hemolytic jaundice, operative absence of the spleen, bile peritonitis due to rupture of the sinus from the gallbladder, infectious hepatitis, perihepatitis, partial atelectasis of the right lung.

Comment. This case was included to illustrate the importance of complete exploration of the bile passages at the time of splenectomy, and that wherever possible cholecystectomy rather than cholecystostomy is the procedure of choice, especially in cholelithiasis with hemolytic jaundice. When both diseases are found, a rational treatment would seem to be splenectomy and cholecystectomy in either one or two operations. In this particular case, although the patient was only four years of age, no reference was made to the condition of the gallbladder. Without doubt this is a point frequently overlooked by surgeons and in all probability this patient would not have died had he been subjected to cholecystectomy at or about the time of splenectomy. Brooks and Clinton[38] reported a case of congenital hemolytic icterus with cholelithiasis in a patient four years of age, who had both splenectomy and cholecystostomy performed at one operation followed by cholecystectomy at a later date.

SUMMARY AND CONCLUSIONS

1. The occurrence of cholecystitis and cholelithiasis in hemolytic icterus is a frequently encountered complication.

2. Two interesting cases of congenital hemolytic icterus with an associated cholecystitis and cholelithiasis are reported in detail.

3. The gratifying result obtained in one is due to the rational judgment of the surgeon, that of complete exploration of the bile passages at the time of splenectomy. The fatal result in the other brings out a point so frequently overlooked by many surgeons; when both diseases are present a rational procedure would seem to be cholecystectomy and splenectomy in either one or two operations.

4. Splenectomy alone will not suffice in the treatment of hemolytic icterus complicated by an associated cholelithiasis.

5. Splenectomy with cholecystectomy rather than cholecystostomy is the operative procedure of choice and removal of the gallbladder is indicated more often than usually exists.

6. Although rare, rupture of a cholecystostomy sinus with resultant peritonitis does occur and when present the end result is frequently fatal.

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SALPINGITIS AND TUBAL PATENCY

FREDERICK L. SCHWARTZ, M.D.
SAN DIEGO, CALIFORNIA

THE question of tubal patency and the most desirable method of determining it are still matters of discussion. The relation of tubal patency to the presence or absence of abnormal change has been given much less thought. Opinion is very definitely divided as to the relative merits of insufflation and hysterosalpingography. While there is general accord that hysterosalpingography gives much more definite information, many gynecologists believe that it also carries more potential hazards for the patient.

Possible complications of hysterosalpingography, listed by Bernardo Schaffer, are: Increase in endometriosis, increased tendency to ectopic pregnancy, toxic phenomena due to iodism, severe infection due to residual inflammatory processes, fat embolism, rupture of the tubes, and rupture of the uterus due to the presence of neoplasm. E. Leinziger lists the dangers as: (1) Chemical toxic, (2) mechanical, (3) embolic, and (4) inflammatory. In his opinion, hysterosalpingography should be done only as a hospital procedure. Yukio Hukata concludes that iodized oil stimulates edema, and that when iodized oil escapes from the Fallopian tubes it produces adhesions in nearby structures.

Comparable ill effects have, on the other hand, been reported with gas insufflation. Greenhill comments on a series of 600 Rubin tests performed by Healy, with three deaths in apparently normal women. All examinations were performed under ether anesthesia, and the deaths were in a group in which nitrous oxide and oxygen were used for insufflation. He deduces that some of these cases must have been hysterosalpingographies. While insufflation is the procedure of his choice, it is his opinion that the injection of iodized oil is practically harmless when properly performed.

Strong proponents of iodized oil are Leventhal and Solomon. They believe that when properly used, it carries a negligible morbidity, and is superior to gas insufflation both from a diagnostic and therapeutic standpoint. The number of pregnancies in their series is remarkable. Out of 114 patients with one or both tubes patent, fifty-one conceived. In nineteen cases with no demonstration of patency, three conceived. In the discussion of this paper, Dr. Ronald Crom summarizes the views of many in the following statement: "My conversion to lipiodol was due to the fact that tubes found to be impervious to carbon dioxide, repeatedly became patent to an oil substance at pressure below that used for gas insufflations. Second, more patients and many of those previously insufflated became pregnant. Third, peritoneal reactions to lipiodol when minimum quantities, 5 to 7.5 cc. were introduced, were no more common than after gas. Fourth, one can learn more about the condition of the uterus, tubes and ovaries than is the case with gas insufflations."

In my own work, while gas insufflation is frequently done, hysterosalpingography became the procedure of choice when in doubt. When the films of an increasing number of cases were studied in conjunction with the patients' histories and physical condition, it seemed possible to obtain more information than the mere matter of tubal patency. Little could be found in the literature, however, as to the significance and prognostic value of the various filling changes in the tubes. Many patients with patency on both sides give a history of repeated attacks of salpingitis, while others with complete bilateral blocking present an entirely negative history and are well.

In the available literature, the first attempt to correlate tubal patency, clinical

and microscopic findings was reported by Watkins and Menne. Using both surgical and autopsy material from patients with chronic salpingitis, forty-nine tubes were injected with radio-opaque material and studied by *x*-ray. Of these tubes they found 30 per cent closed and 22 per cent narrowed in the intramural position. In the isthmian portion, 40 per cent were closed and 32 per cent narrowed. The fimbriated end was closed in 38 per cent of the cases. Occlusion seemed to depend on whether or not the fimbriae were adherent to the ovary.

An interesting and apparently valid explanation of the fact that tubes may be blocked at the cornu and the patient quite free from symptoms, is found in a paper by Falk, in which he recommends tubal resection for recurrent salpingitis. It is his contention that tubes tend to heal and sterilize themselves if not reinfected from below. Forty-three, 67 per cent, of the cases in which tubal resection was done were reported as clinically cured, or asymptomatic. Sixteen cases, or 24 per cent, had slight symptoms, and five cases, or 7 per cent, had definite complaints.

In a previous communication, I have described a method of obtaining a graphic record of the amount of uterine mobility by a minor variation from the usual technic of hysterosalpingography. This method was used in a series of 200 hysterosalpingographies. In order better to correlate radiographic findings with actual tissue changes, it was decided to review this series. The past history, the physical findings, and, as far as possible, the end results were listed together with the filling defects noted.

FIG. 1. Film not a part of this series but shown through the courtesy of an associate. Vascular filling and apparent perforation; no ill effects.

Thirty-five of the films were rechecks, leaving 165 patients to be considered. All of these films were made as an office procedure, and in no case there was sufficient reaction to prevent the patient coming in for her twenty-four hour film, or from carrying on her regular occupation. All injections were made through a soft tipped cannula and manometric control was not used. Injections were made very slowly and gently and after 3 to 4 cc. a film was exposed, developed and viewed before proceeding. Injection was discontinued, however, and a film made, regardless of the amount injected, if the patient complained of severe pain.

At first the series consisted solely of sterility studies, but more recently I have extended the indications to include patients with recurrent salpingitis who desired children. There were several reasons for this step. As my experience grew, I found in sterility studies that hysterosalpingography

in patients with a previous history of salpingitis evoked no more reactions than in any other patient, provided the condition was quiescent. Secondly, such a study in a group of patients who required salpingectomy offered an opportunity to compare the radiographic with the surgical and pathologic picture. Also, in many border-line cases much time might be saved in deciding whether child-bearing was possible or probable, and whether conservative treatment should be continued or surgery advised.

Fig. 2. Case No. 155. Left-sided salpingitis; narrowing and stricture of tube; polyp near left cornu causing spotting; patient had an unsuccessful curettage prior to her referral.

Apart from the present series but interesting in demonstrating complications that may arise, and also that they are less serious than commonly considered, is a film (Fig. 1) made in my office by an associate, a gynecologist of unquestioned ability and experience. Contrary to custom, for some reason, this film was not carefully studied until after the patient had returned the following day for her twenty-four hour check. In the fundus there appears to be a perforation from the cannula with oil pouring through the perforation. In addition the vascular channels are filled with oil. Inquiry developed the fact that the patient experienced one sharp pain during the procedure, but felt quite well afterward and continued her occupation as a war worker on the following day without symptoms or complications of any kind.

To facilitate analysis the cases are tabulated in series; patency or blocking at cornu, isthmus and fimbria is designated, together with information as to the patient's condition. Many of the patients listed as recurrent salpingitis presented only minimal symptoms which were relieved by occasional treatment. In all patients subjected to surgery, findings were confirmed by tissue examination and the patients were all relieved of their symptoms.

In the present series of 165 patients, there were twelve pregnancies, and eighteen on whom bilateral salpingectomy was done. In all patients subjected to surgery, all tubes were studied by serial sections, by Dr. James D. Edgar, head of Department

of Pathology, Mercy Hospital, San Diego, California.

All but four of these patients had some degree of tubal patency, but in no case at surgery was there found any evidence of irritation from the iodized oil. As previously mentioned, none of these patients presented any untoward reaction from the examination; however, no such examination was made until the patient was temperature free and quiescent for several weeks and could withstand a fairly vigorous bimanual examination without reaction.

It is quite probable that there would have been a larger number of pregnancies had it not been for the war. No doubt some families are deferring pregnancies for the time being, and other families are separated.

There were twenty-nine women with both tubes completely patent and with entirely negative history and findings. There was only one pregnancy in this group, but it may be added that disturbances of ovulation were quite frequent in the same group.

With both tubes patent but some history of salpingitis, there were seventy-four patients. In this group tubes were listed as patent, provided they were permeable to oil, even though there was evidence of partial obstruction. From serial films it appeared that many of these tubes had been opened by pressure of the oil. Of these women, nine became pregnant and seven were subjected to surgery. The number of pregnancies is greatest in this group and most pregnancies followed shortly after hysterosalpingography. Very possibly mechanical opening may have been a factor. All of the pregnancies reported were normal uterine and no cases of ectopic gestation were encountered.

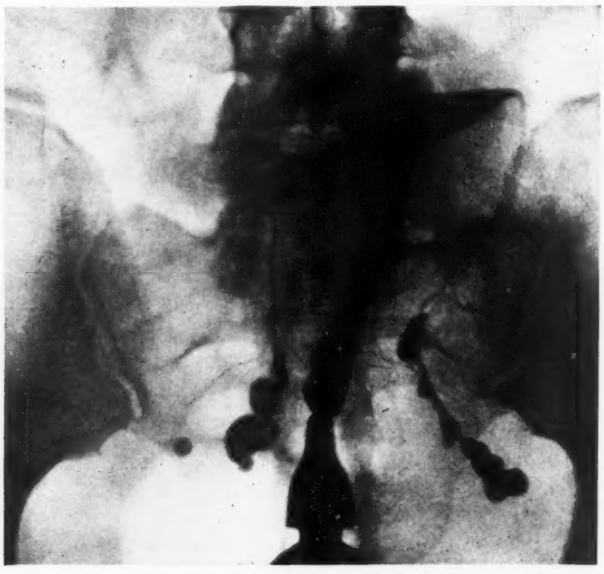

Fig. 3. Case No. 136. Recurrent bilateral salpingitis; large low hanging tubes; both tubes patent; beading and dilation at extremities.

In five patients one tube was found to be patent with the other blocked at the cornu. None of these patients could recall any definite attacks of pelvic disease although all admitted occasional pelvic pain during childhood and puberty. In this group no evidence of salpingitis was found on pelvic examination and two became pregnant shortly after study.

There were twenty-one women with one tube patent and the other blocked at the cornu who complained of pain on the patent side. Most of these patients stated that their pain had previously been bilateral or even more severe on the opposite side. Physical examination confirmed the diagnosis of salpingitis on the patent side. In this group there were no pregnancies

and seven of these women required surgical relief.

In four patients with one tube blocked at the cornu there were bilateral symptoms and one patient with one tube blocked at the cornu presented symptoms on the same side. In all of these women the symptoms were mild in nature and may have been maintained through the lymphatics.

One patient had one tube patent and the other blocked at the isthmus. About a year prior to her sterility study a large right ovarian cyst was removed and a portion of the tube was removed with the cyst. She has not become pregnant and further study shows the majority of her cycles to be anovulatory. There were no history, symptoms or findings characteristic of salpingitis in this patient.

Five women had one tube blocked at the fimbriated extremity and one of these required radical surgery for relief of her symptoms. In these cases there had obviously been at some time a sufficiently severe inflammatory process to cause the fimbriae to adhere to the ovary or other adjacent structures.

An interesting group consists of eleven women with both tubes blocked at the cornu. One of these patients required surgery for the relief of her symptoms. The other ten were free from symptoms and significant clinical findings at the time of study. These ten were sterility studies in which gas would not pass and here again further questioning developed the presence of vague undiagnosed pelvic pain in their earlier years. It seems probable that in these patients a pre-existing salpingitis had healed after occlusion at the cornu.

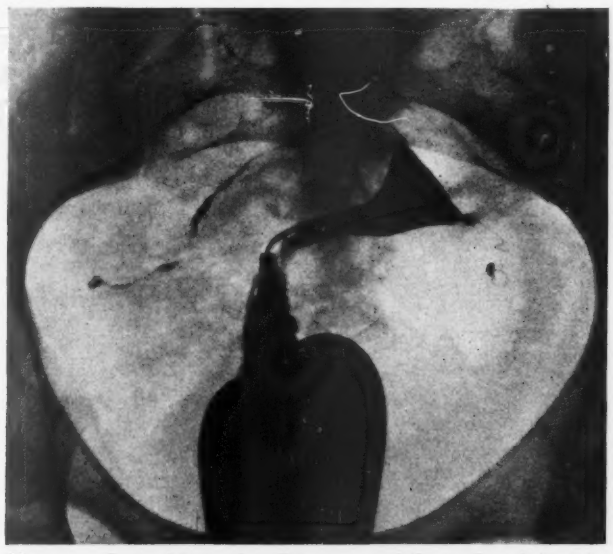

Fig. 4. Case No. 165. Recurrent bilateral salpingitis; surgery; both tubes partially patent; narrowing of tubes with displacement of uterus.

Two patients presented bilateral isthmial blocking. One of these had mild recurrent salpingitis. In the other there had been a gonorrheal salpingitis followed by a bilateral hemisalpingectomy. She is quite well at the present time.

In eight patients one tube was blocked at the cornu and the other at the fimbriated extremity. Five of these were well and without any significant physical findings at the time of study. Two of the three presenting symptoms required operation.

Four patients had both tubes blocked at the fimbriated extremities. Three of these were free from symptoms and had no definite history of salpingitis. The other has had a bilateral salpingectomy.

Many of the patients with one tube blocked at the cornu gave a history of previously having had symptoms on the

blocked side. It is significant to note that of eleven women with bilateral cornual blocking ten were well.

One additional finding of interest is the fact that a fair number of women find their symptoms relieved by hysterosalpingography. There has been neither sufficient time elapsed nor a sufficient number of cases to evaluate properly this finding. Whether this improvement is due to the possible hydraulic opening of the tubes or to the local effect of the oil is impossible to determine. In view of the varied treatments many of these patients have had, I cannot consider the effect entirely psychic.

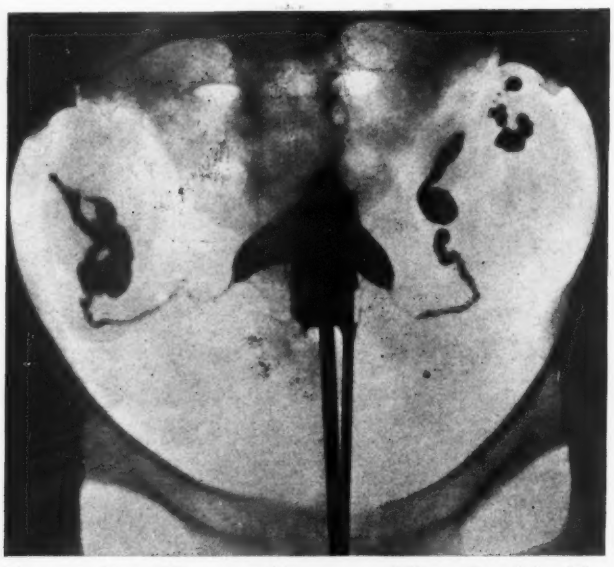

FIG. 5. Case No. 131. Recurrent bilateral salpingitis; surgery; both tubes patent but elongated with clubbing and adhesions at extremities.

When the tubes are patent in the presence of definite salpingitis the most characteristic radiologic findings are elongation, redundancy and clubbing of the extremity and areas of narrowing. Usually the uterus is displaced to one side, probably due to contraction of a previous inflammation. The tube on that side may be narrowed or beaded near the uterus, the midportion looped or convoluted, and the fimbriated extremity low and often partially obstructed. The opposite tube is elongated and usually narrowed and may show similar changes at the extremity. In spite of their permeability pregnancy was rare in this type of tube.

The films selected (Figs. 2, 3 and 4) from this series for presentation show these changes fairly well. The not infrequent findings of tubal occlusion in young women that are symptom free and without history of infection suggest the possibility of a blood or lymph-borne salpingitis during childhood or adolescence. It may be that some of the vague, lower abdominal pains in young girls are an unrecognized salpingitis.

SUMMARY

In determining tubal patency, hysterosalpingography, when properly done, even in the presence of salpingitis, carries no more risk than any other diagnostic procedure. While it carries more possible complications, the morbidity is negligible, and it is superior to gas insufflation from both diagnostic and therapeutic standpoints.

In the presence of salpingitis of sufficient duration and severity to warrant surgery, but in which preservation of child-bearing function is desired, this procedure is of value in deciding between continued local treatment and surgery.

	Right C.I.F.	Left C.I.F.	
1. C. A.	000	000	Mild recurrent bilateral salpingitis
2. T. A.	000	000	Mild recurrent bilateral salpingitis
3. F. B.	000	000	Negative findings. Negative history
4. L. B.	000	000	Mild recurrent bilateral salpingitis
5. J. B.	000	000	Mild recurrent bilateral salpingitis
6. C. J. B.	000	000	Mild recurrent salpingitis
7. E. B.	B—	B—	Previous salpingitis, now well
8. M. B.	000	B—	Now has right salpingitis
9. L. H. B.	000	000	Pregnancy
10. M. F. B.	000	000	Previous G. C., salpingitis; pregnancy
11. L. B.	00B	00B	Bilateral abscesses; surgery
12. O. L. B.	000	000	Bilateral salpinigitis
13. G. B.	000	000	Bilateral salpingitis
14. P. B.	000	000	Negative findings and history
15. P. I. B.	000	000	Negative findings and history
16. J. R. B.	000	000	Bilateral salpingitis
17. G. M. C.	000	000	Negative findings and history
18. R. G. C.	000	000	Bilateral salpinigitis; pregnancy
19. L. R. C.	000	000	Bilateral salpingitis; surgery
20. C. L. C.	000	000	Bilateral salpingitis
21. W. F. L.	000	000	Negative history and findings
22. B. C.	000	000	Negative history and findings
23. L. C.	000	000	Bilateral salpingitis
24. A. C.	000	000	Negative history and findings
25. D. C.	000	000	Bilateral salpingitis
26. L. C.	B—	000	L. Salpingitis; surgery
27. S. C.	000	000	Uterus didelphys; bilateral salpingitis
28. E. C.	B—	B—	Previous salpingitis; well at present
29. B. C.	000	000	Bilateral salpingitis; surgery
30. E. D.	000	000	Negative history and findings
31. S. J. D.	000	000	Bilateral salpingitis
32. C. D.	000	000	Bilateral salpingitis
33. E. L. D.	000	000	Bilateral salpingitis
34. V. D.	B—	00B	Previous salpingitis; well at present
35. M. D.	000	000	Bilateral salpingitis
36. M. C. D.	000	000	Negative history and findings
37. B. D.	000	000	Negative history and findings
38. E. D.	000	000	Bilateral salpingitis
39. F. D.	00B	B—	Bilateral salpingitis; surgery
40. F. E.	000	B—	Right salpingitis
41. M. E.	B—	B—	Previous G. C.; salpingitis; well at present
42. J. E.	000	000	Bilateral salpingitis
43. L. F.	000	000	Bilateral salpingitis
44. A. L. G.	000	000	Bilateral salpingitis
45. W. E. G.	000	000	Bilateral salpingitis
46. W. I. G.	000	000	Negative history and findings
47. M. G.	000	000	Bilateral salpingitis
48. D. G.	000	000	Bilateral salpingitis
49. M. H.	000	000	Negative history and findings
50. R. H.	000	000	Bilateral salpingitis
51. C. H.	000	000	Right salpingitis
52. M. H.	00B	00B	Puerperal infection; well at present
53. H. H.	B—	00B	Previous salpingitis; well at present
54. G. H.	000	000	Bilateral salpingitis
55. M. H.	00B	000	Bilateral salpingitis
56. C. E. H.	000	000	Right salpingitis
57. V. F. H.	000	B—	Pregnancy
58. E. H.	000	000	Salpingitis; pregnancy
59. L. I.	000	000	Salpingitis; pregnancy
60. L. J.	000	000	Bilateral salpingitis
61. E. J.	000	000	Right salpingitis; surgery
62. F. J.	B—	000	Left salpingitis; surgery
63. J. J.	000	000	Bilateral salpingitis; surgery
64. A. J.	000	000	Negative history and findings
65. D. K.	000	000	Previous severe G. C.; salpingitis; well now
66. M. K.	000	000	Left salpingitis
67. T. K.	000	000	Previous salpingitis; pregnancy
68. W. K.	000	000	Bilateral salpingitis
69. E. L.	B—	000	Left salpingitis; surgery
70. J. L.	B—	000	Left salpingitis; previously on right
71. M. L.	000	000	Bilateral salpingitis
72. H. L.	000	000	Bilateral salpingitis
73. L. L.	000	000	Bilateral salpingitis
74. A. L.	000	B—	Right salpingitis
75. F. L.	000	000	Bilateral salpingitis
76. G. M.	000	000	Bilateral salpingitis
77. P. McK.	000	000	Negative history and findings
78. C. M.	000	000	Bilateral salpingitis; surgery
79. B. F.	000	B—	Right salpingitis
80. A. B.	B—	000	Left salpingitis; surgery
81. V. S.	B—	B—	Previous salpingitis; well now
82. L. W.	B—	B—	Bilateral salpingitis; surgery
83. S. E.	000	000	Bilateral salpingitis
84. D. L.	00B	000	No salpingitis; previous right oophorectomy
85. H. K.	[illegible]	000	Negative history and findings
86. R. M.	000	000	Negative history and findings

	Right C.I.F.	Left C.I.F.	
87. J. M.	ooB	ooB	Previous G. C.; salpingitis; well now
88. E. M.	ooo	B—	Right salpingitis; previously on left
89. V. McF.	ooo	ooo	Negative history and findings; pregnancy
90. M. M.	ooo	ooo	Previous G. C.; salpingitis; well now
91. H. M.	ooo	B—	Negative history; has large left ovarian cyst
92. L. M.	ooo	ooo	Negative history and findings
93. A. N.	ooo	ooo	Bilateral salpingitis
94. A. H. N.	ooo	ooo	Negative history and findings
95. B. N.	ooo	ooo	Bilateral salpingitis
96. C. M. N.	ooo	ooo	Bilateral salpingitis
97. F. O.	ooo	B—	Right salpingitis
98. J. P.	ooo	ooo	Bilateral salpingitis
99. W. H. P.	B—	ooo	Bilateral salpingitis
100. M. P.	ooo	ooo	Bilateral salpingitis
101. I. P.	B—	B—	Previous salpingitis; well now
102. A. P.	B—	ooB	Previous salpingitis; well now
103. J. P.	B—	ooo	Left salpingitis
104. C. F. P.	oB–	oB–	Previous bilateral hemisalpingectomy; well now
105. B. P.	B—	ooo	Bilateral salpingitis
106. R. P.	ooo	B—	Negative history and findings
107. O. P.	ooo	ooo	Bilateral salpingitis
108. B. W. P.	ooo	ooo	Bilateral salpingitis
109. C. W. R.	B—	ooB	Well now, previous salpingitis
110. C. R.	ooo	ooo	Negative history and findings
111. A. R.	ooo	ooo	Negative history and findings
112. M. R.	B—	ooB	Left salpingitis
113. K. R.	B—	ooB	Negative history and findings
114. E. R.	ooo	ooo	Bilateral salpingitis
115. L. R.	ooo	ooo	Bilateral salpingitis
116. J. R.	ooo	ooo	Previous salpingitis; well now
117. W. S. R.	ooo	B—	Right salpingitis
118. L. R.	ooo	ooo	Bilateral salpingitis
119. M. R.	ooo	ooo	Negative history and findings
120. W. R.	B—	ooo	Right salpingitis
121. D. R.	ooo	ooo	Negative history and findings
122. E. R.	ooo	ooo	Negative history and findings
123. J. S.	ooo	ooo	Bilateral salpingitis
124. G. S.	oB–	oB–	Bilateral salpingitis
125. M. S.	ooo	ooo	Bilateral salpingitis; surgery
126. D. S.	ooB	B—	Bilateral salpingitis; surgery
127. D. E. S.	ooo	ooo	Bilateral salpingitis; pregnancy
128. N. S.	ooo	ooo	Bilateral salpingitis
129. M. S.	ooo	ooo	Bilateral salpingitis
130. M. A. S.	ooo	ooo	Bilateral salpingitis; surgery
131. A. S.	ooo	ooo	Bilateral salpingitis; surgery
132. E. S.	B—	B—	Bilateral salpingitis; well now
133. L. S.	ooo	B—	Right salpingitis
134. R. S.	ooo	ooo	Negative history and findings
135. W. S.	ooo	ooo	Negative history and findings
136. M. F. S.	ooo	ooo	Bilateral salpingitis
137. H. L. S.	ooB	ooB	Bilateral salpingitis
138. J. F. S.	ooo	ooo	Negative history and findings
139. H. S.	ooo	ooo	Bilateral salpingitis
140. R. E. S.	ooo	ooo	Bilateral salpingitis
141. D. T.	ooB	ooo	Bilateral salpingitis
142. D. E. T.	ooo	ooo	Bilateral salpingitis; pregnancy
143. G. T.	B—	B—	Negative history and findings
144. G. H. T.	B—	B—	Previous salpingitis; well now
145. J. T.	ooo	ooo	Bilateral salpingitis
146. F. T.	ooo	ooo	Bilateral salpingitis
147. D. V.	B—	ooo	Well; previous tubal plastic
148. B. V.	ooo	ooo	Bilateral salpingitis; pregnancy
149. M. W.	B—	ooo	Left salpingitis
150. E. W.	B—	ooo	Bilateral salpingitis
151. L. W.	ooo	B—	Right salpingitis
152. B. W.	oB–	ooo	Well; previous right hemisalpingectomy
153. R. W.	ooo	B—	Right salpingitis
154. J. W.	ooo	ooo	Bilateral salpingitis
155. O. S. W.	B—	ooo	Left salpingitis
156. A. M. W.	ooo	ooo	Negative history and findings
157. M. B. Y.	B—	B—	Previous salpingitis; well now
158. M. R.	ooo	B—	Right salpingitis; surgery
159. M. C. B.	ooo	ooo	Bilateral salpingitis
160. V. G.	ooo	ooo	Negative history and findings
161. W. H.	ooo	B—	Right salpingitis; surgery
162. A. J. W.	ooo	ooo	Bilateral salpingitis
163. K. Y.	B—	B—	Well now; previous salpingitis
164. U. W.	ooo	B—	Salpingitis; pregnancy
165. M. I.	ooo	ooo	Salpingitis; surgery

A series of 165 patients was reviewed. Radiographic findings were compared with the surgical and pathologic picture. There were twelve pregnancies and eighteen on whom bilateral salpingectomy was done. In all those coming to surgery, definite tissue changes were found, and all pa-

tients were free from symptoms after surgery.

Salpingitis may be present even though a tube is permeable. Such tubes present certain characteristic radiologic features, such as elongation, clubbing and redundancy at the extremity, and areas of stenosis and dilation. Pregnancy is rare in this type of tube in spite of its permeability.

Occlusion at the cornu prevents reinfection from below and as a general rule results in self-sterilization and healing of the tubes.

There were twenty-nine women with both tubes completely patent, with entirely negative history and findings. Disturbances of ovulation were quite frequent, with only one pregnancy in the group.

Seventy-four patients had both tubes patent but some history of salpingitis. In this group tubes were listed as patent, provided they were permeable to oil, even though there was evidence of partial obstruction. From serial films it appeared that many of these tubes had been opened by pressure of the oil. Of these, nine patients became pregnant and seven were subjected to surgery.

Of five patients with one tube patent and the other blocked at the cornu, with negative history and findings, two became pregnant.

Twenty-one women had one tube blocked at the cornu, with symptoms on the patent side. There were no pregnancies and seven of these required surgery.

With one tube blocked at the cornu, four cases had bilateral symptoms, and one case presented symptoms on the same side. One patient had one tube patent, and the other blocked at the isthmus, following removal of a large ovarian cyst.

Five women had one tube blocked at the fimbriated extremity, and one of these required surgery.

Of eleven cases with both tubes blocked at the cornu, ten were well and the other well after operation.

Two patients had both tubes blocked at the isthmus. One had previously a bilateral hemisalpingectomy and is well; the other had mild recurrent salpingitis.

Eight women had one tube blocked at the cornu and the other blocked at the fimbriated extremity. Five were free from symptoms, and two of the three with symptoms required operation.

Four patients had both tubes blocked at the fimbriated extremities; three are well and the other has had a bilateral salpingectomy.

The not infrequent radiologic findings of tubal damage in young women with completely negative histories and tubal findings suggests the possibility that the vague lower abdominal pains often complained of during childhood and adolescence may be the result of an unrecognized blood or lymph-borne salpingitis.

In a number of cases with a record of previous varied treatments, symptoms have been relieved by hysterosalpingography.

Tubal patency can be and often is coincidental with salpingitis, although the majority of such tubes are not completely patent. Cornual occlusion usually results in self-sterilization and self-healing.

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PLASMA FIXATION OF SKIN GRAFTS

J. EASTMAN SHEEHAN, M.D.
Professor of Plastic Reparative Surgery, Polyclinic Medical School and Hospital
NEW YORK, NEW YORK

THE covering of defects by free full thickness skin grafts has been developed during the past twenty years from a status in which there was no more than a 50 per cent success with small grafts, to one in which, even with large grafts, there is hardly ever a failure. Contributory to this improvement were, first, the recognition that restoration in the moribund graft was effected by arterial infiltration from the tissues of the base; second, that pressure must be adapted to promotion of such infiltration, not too little or the contact would be broken and not too much or the arterioles could not penetrate. It was observed that the infiltration went better when excision was made not only of the subcutaneous fat but also a segment of the corium.

The graft was cut according to the pattern of the defect. It shrank and must, therefore, be sutured in place, and this necessarily under tension. It was at first assumed that the graft when raised should be washed in saline solution to get rid of the sera. In my own experience, it was clearly better to allow the graft to rest a while in its own sera and that of the donor area. This was due, first, to the fact that such sera were a temporary protection against infection and, second, that they ensured a fibrinous adhesion between graft and host during what might be a critical twenty-four hours or more.

In her researches into the behavior of tissues, Dr. Machteld E. Sano, at Temple University, Philadelphia, has enlarged upon this last factor to an extent that quite probably has altered the whole technical plan. By painting the host with plasma and the graft with leucocyte cell extract, the adhesion is perfect, the sutures are unnecessary, the degree of pressure is no longer a problem, and the circulation within the graft is established so rapidly that overlapping edges bleed when cut on the second day. On the fourteenth day, as a rule, definite recovery is achieved and in two months the graft is indistinguishable, in coloration or by its boundaries, from the neighboring skin. As this applies to every order of graft (and to some other conditions) application of the principle involved obviously constitutes a revolutionary advance in the art of skin grafting. I present some observations derived from my own experience that bear upon its use in reparative practice.

To begin with, the patient supplies his own plasma and cell extract. As a working detail, it is well to mention that this should be at the time of operation. If the blood which provides them is taken the day before, it loses some of its restorative quality by the time it is used. As the amount is only 5 cc., its being taken at operation can have no ill effect.

The blood is withdrawn by an aspiration needle from the vein into a syringe of 10 cc. capacity. To maintain its fluidity when under treatment later, 1 mg. of heparin and 1 cc. of Tyrode's solution* are placed in the syringe before the aspiration.

The contents of the syringe are transferred to a centrifuge tube. This, balanced by one of alcohol in equal volume, is centrifuged by any electrical apparatus for twenty minutes. In the tube there will then be a physical division of the blood, the blood plasma on top, the red cells at the bottom, and a thin film of the white cells

*Tyrode's solution consists of sodium chloride, 8.0 Gm, potassium chloride, 0.2 Gm., calcium chloride, 0.2 Gm., magnesium chloride, 0.1 Gm., sodium acid phosphate, 0.05 Gm., sodium bicarbonate, 1.0 Gm., glucose, 1.0 Gm., with distilled water added to make 1,000 cc.; filtered through Berkefeld filter "W".

between. (Fig. 1.) The plasma is drawn off by pipette and syringe and inserted in another tube. (Fig. 1B, C.) The film of the area has been thoroughly cleansed with warm saline solution and dried with sterile gauze. Using a light camel hair

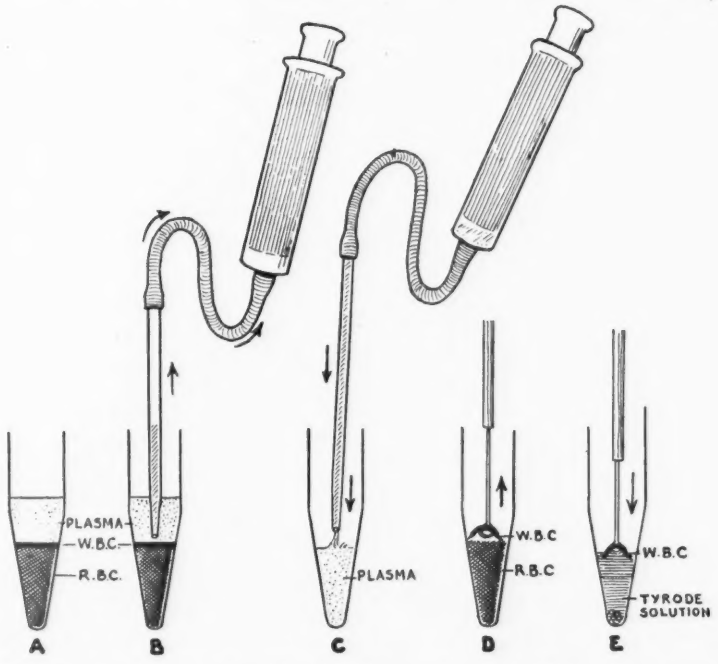


FIG. 1. A, tube, showing blood division after centrifuge; B, plasma transferred by pipette and syringe to separate tube; C, white cell film scooped from first tube, D, and transferred to another tube, E, containing Tyrode's solution and glass beads.

leucocytes in the first tube is scooped off and deposited in still another tube, into which there have been dropped 1½ cc. of Tyrode's solution, and also a few glass beads to facilitate shaking the contents. (Fig. 1D, E.) The tubes containing the plasma and cell extract are set in cool water.

These resultants are sufficient for a full thickness graft up to 10 by 10 inches.

In raising the graft, allowance is made for the change in method of application. When it was the practice to suture the graft under tension, it was made to an exact pattern of the defect to be covered. It is now made 20 per cent larger than the pattern, since it is to be fitted into place without such tension.

When the graft is ready, the recipient area is given a light treatment with a sulfonamide, penicillin or gramicidin, as a precaution against the possible flare up of some dormant infection remaining after brush, the area is then painted with the plasma, (Fig. 2A.) The plasma must not be spread too thickly, as the extra cells, remaining in liquid form under the graft, would tend to vitiate the adhesion and so militate against the success of the replacement.

Next, the raw surface of the graft is similarly lightly painted with the cell extract (Fig. 2B) to which some propamadine and/or sulfadiazine may be added. A sulfonamide is also given by mouth.

With the two surfaces thus treated, the graft, with its leucocytes, is imposed on the defect with its plasma. The graft is fixed at the ends of its lower line with Michel clamps. As it will have shrunk considerably (Fig. 2C), it must be stretched into place. This is best accomplished by use of a hand roller. (Fig. 2D.) Added pressure by cardboard and hand completes the procedure. No dressing or bandage is applied.

In the earlier experiments it was assumed that the graft might be allowed to overlap the skin edges of the defect. This is not good practice. There is life in the overlap on the second day, but it dies on the fourth or fifth; and in cutting it away an unsatisfactory apposition at the defect skin edges is inevitable. Stretching by roller pressure, on the contrary, banks the graft edges accurately against those of the defect, a little cardboard and hand pressure is added and the approximation is maintained sufficiently by means of a few clamps. (Fig. 2E.) These are removed before the fourth hour.

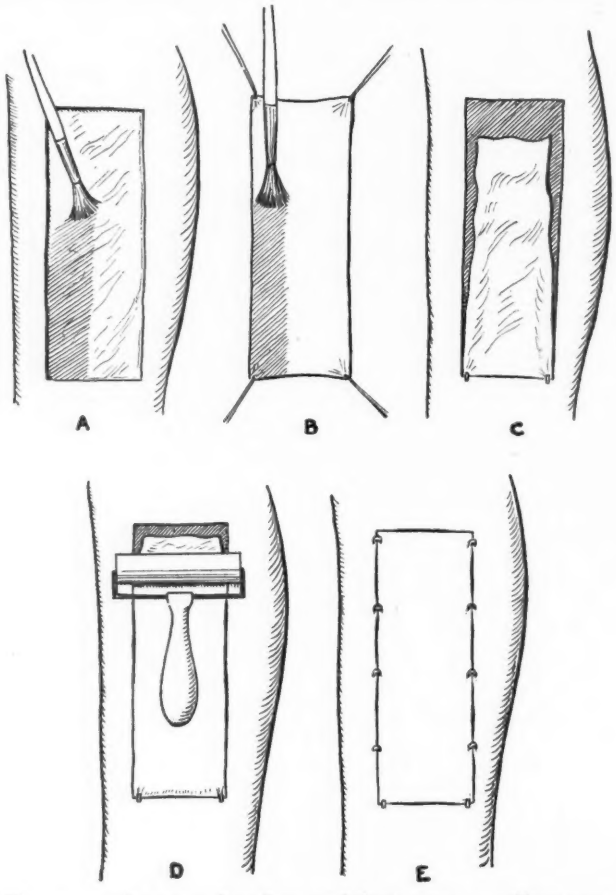


Fig. 2. A, plasma painted on recipient area; B, cell extract painted on raw surface of graft; C, graft hinged at base by Michel clamps; D, graft spread by hand roller, and adhered by cardboard and hand pressure; E, apposition retained by clamps (removed in four hours).

Adhesion is immediate and complete. What happens is that the prothrombin in the cell extract, when in contact with the plasma, is converted into thrombin; and the thrombin, acting upon the fibrinogin in the plasma, converts it into fibrin. A fibrin matrix is thus provided which seals the graft to its host. The fibrinogen in the plasma will, of itself, supply such a matrix and will ensure prompt adherence, as was demonstrated on one occasion when the tube containing the cell extract was dropped before the painting of the graft was completed and the contents were lost. But the plasma alone will not promote that rapid restoration of the graft that is the distinguishing factor in this method. The contribution of a fibrin matrix to the cultivation of living cells, which has always been recognized, is accelerated by the contact with the cell extract. This has been amply demonstrated. It shows the possession by the leucocytes of a function not

hitherto ascribed to them, and for which further research doubtless will account.

The process of recovery is interesting to watch. At first it should be watched from hour to hour. In a few hours the graft may become dry and should be coated with yellow sterile petroleum jelly. At the outset it is dead white. If only the plasma has been used, it is still a dirty white after four days. When both essences have been employed, the graft takes on a purplish tinge after about four hours. In rather more than twenty hours there are definite signs of life. (Overlap bled when cut on the second day.) The graft is a full purple on the second day. From then until the seventh day the purple becomes mottled with lighter tones. Patches reminiscent of sunlight exposure may appear on the fourth or fifth day, but they seem to have no deleterious effect. Pinkish tinge is present on the tenth day, and on the fourteenth this has advanced to the color of bright natural skin. From then on the progress continues until, in two months, the graft is indistinguishable from its surroundings.

All this can be observed in the open because the element of adjusted pressure is eliminated and there is no need for bandage. The only pressure applied is at the time the graft is imposed and then only with the hand roller, followed by such cardboard and hand pressure as may be needed to assure adherence over the whole surface. Cellophane tape gives adequate cover for the approximation lines after the clamps are removed. Precautions for protection may be necessary, especially if the graft is a large one. A hood with a cellophane window may be sufficient. If possible, the patient should be segregated in the interest of averting secondary infection. It was found advisable, in the case of a patient with a very large graft on the leg, to provide a hood under the bedclothes, to keep the legs apart by means of a rod attached at the ankles, and to restrict the scope of motion of the hands.

Now and again there may be unlooked for oozing from some small vessel of the host. If it continues and if there are evidences of infection, it is best to wait for forty-eight hours, and then take such measures as are required. This may include the indication of some spots that have not

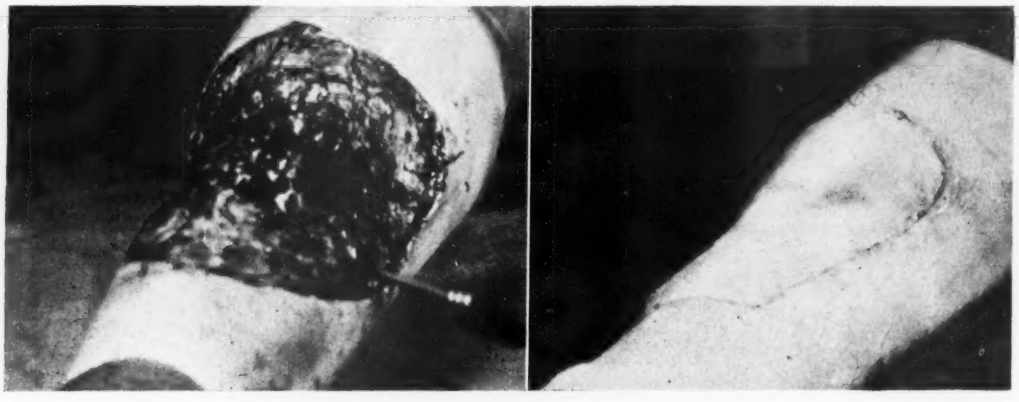
A B

Fig. 3. A, erethistic ulcer of long standing; B, repair by full thickness skin graft, plasma fixation method.

"taken." As to these it usually is best to wait and regraft.

It is not entirely new to reparative surgery that plasma can be used to advantage in the exterior treatment of wounds. The fact that plasma infusion adds to the supply of fibrinogen and, therefore, of fibrin at the area of healing, long ago suggested that it might promote healing if locally applied. I have, for example, mixed plasma with scrapings of epidermis and smeared the mixture over large and refractory wounds and have witnessed a gratifying epithelization. It may also, when mixed with the bacteriostatic compounds, be effective in the healing of infected wounds.

This compound of plasma and cell extract certainly adds to the resources of the surgical armory. It has been found to seal wounded liver tissues in which suturing leads only to bleeding, and to have been of equal effect when employed on wounds of the spleen. It is invaluable in those facial injuries in which there are flaps of torn skin whose immediate return is of high importance and in the elimination of disfiguring scar. It should make possible the closure of many not too large wounds without sutures. It offers great hope of application in many situations, as in the face and hands, with which reparative surgery is confronted from time to time.



A B

FIG. 4. Same patient as in Figure 3. A, photograph of the wound after dissection; B, illustration showing how completely the graft adheres without sutures.

SURGICAL RELIEF OF THE HYPOGLYCEMIC STATE PROBABLY DUE TO ORGANIC HYPERINSULINISM*

GEORGE E. PFEIFFER, M.D. AND LESTER H. EISENDORF, M.D.†
Chief of the Surgical Service, Veterans Hospital — Assistant in Surgery, Veterans Hospital
PORTLAND, OREGON

REPORTS on the surgical treatment of organic hyperinsulinism have appeared in the literature with increasing frequency in the past decade. The impetus given these reports no doubt dates back to 1924, when Seale Harris[1] first proposed the concept of hypoglycemia due to endogenous hyperinsulinism. That insulin could produce hypoglycemia was already known. This idea was further accelerated by Roscoe Graham, of Toronto, who successfully cured a patient with symptoms of hyperinsulinism by removal of a pancreatic adenoma. This case was reported by Howland, Campbell and Maltby.[2] The first conclusive and indisputable evidence that islet adenomas could cause spontaneous hypoglycemia was presented by Wilder[3] and his co-workers in their now classic work.

While the number of reports has increased, hyperinsulinism still remains relatively rare. Up to 1942, Whipple,[4] whose studies have been most complete, has reported a total of only 158 cases that had been verified either by laparotomy or necropsy. At this hospital the present case is the first one demonstrated in over 39,000 admissions.

As the syndrome of hyperinsulinism became clarified it was readily evident that there were many other factors responsible for hypoglycemias. Because of this it was at once apparent that before such a diagnosis was tenable the other causes of hypoglycemia must be ruled out. The etiologic classification of hypoglycemias by Conn,[3] who has done extensive work on the subject, follows as a basis for differential diagnosis:

I. Organic—recognizable anatomic lesion
  (a) Hyperinsulinism
    1. Pancreatic island cell carcinoma
    2. Pancreatic island cell adenoma
    3. Generalized hypertrophy and hyperplasia of islands of Langerhans
  (b) Hepatic disease
    1. Ascending infectious cholangiolitis
    2. Toxic hepatitis
    3. Diffuse carcinomatosis
    4. Fatty degeneration; "fatty metamorphosis"
    5. Glycogenosis (von Gierke's disease)
  (c) Pituitary hypofunction (anterior lobe)
    1. Destructive lesions (chromophobe tumors, cysts and so on)
    2. Atrophy and degeneration (Simmonds' disease)
    3. Thyroid hypofunction (secondary to pituitary hypofunction?)
  (d) Adrenal hypofunction (cortex)
    1. Idiopathic cortical atrophy
    2. Destructive infectious granulomas
    3. Destructive neoplasms
  (e) Central nervous system lesions (lesions of brain and brain

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† Now assigned to active duty as Captain, Medical Corps, Army of the United States.

stem; said to interfere with nervous control of blood sugar)

II. Functional—no recognized anatomic lesion
   (a) Hyperinsulinism (autonomic nervous system imbalance?)
   (b) Renal glycosuria (severe degrees of low renal threshold for dextrose)
   (c) Severe continuous muscular work
   (d) Pregnancy and lactation

From the above it is obvious that in many instances it is difficult if not impossible to arrive at a positive preoperative diagnosis of organic hyperinsulinism. In an effort to simplify this, Whipple[6] has laid down certain criteria which, if met, justify laparotomy. These criteria or Whipple's so-called "Triad" are: (1) attacks of insulin shock coming on during fasting or in an over-fatigued state, (2) blood sugar readings of 50 mg. per cent or less, (3) relief from ingestion of glucose.

While the above criteria are definite they are probably not to be considered hard and fast. Wilder[7] declares the following similar data as prerequisites to laparotomy at the Mayo Clinic: (1) normal health and evidence of stability of the autonomic nervous system prior to first episode of hypoglycemia, (2) postabsorptive glucose tolerance curves of less than 60 mg. per cent, (3) intolerance for fasting.

In addition to the above, considerable emphasis has been placed by some on the glucose tolerance curve as being significant in diagnosis. Several have described glucose tolerance curves believed to be typical of hyperinsulinism. Among these is the so-called "paradoxic" curve noted by Smith and Seibel,[8] and Meyer with others.[9] This refers to the fact that the curve is similar to a diabetic one in contour but is produced by a state directly opposite to diabetes, viz., hyperinsulinism. The similarity in the two curves arises from the fact that the peak of the curves occurs at the end of two hours. In hyperinsulinism the values are obviously uniformly lower than in diabetes.

Womack[10] describes the "flat" type of curve first demonstrated by Rabinovitch and Fowler, as highly significant in hyperinsulinism. In this curve there are uniformly low values throughout after ingestion of the glucose. Even the peak levels at one and two hours are low.

Wilder[11] on the other hand considers the glucose tolerance data as less dependable diagnostic measures. He emphasizes that all types of curves have been obtained in verified cases. He further points out that the glucose tolerance test varies widely in different healthy individuals and even in the same subject.

The basis for the above is also borne out by the metabolic studies of Conn and Conn.[12] They have adequately demonstrated that the preliminary diet strongly influences the type of curve obtained. They point out the necessity of carrying patients on standard diets prior to the test so as to obtain greater uniformity of results.

Although most of the original surgery performed for organic hyperinsulinism was done with the hope of removing islet cell tumors it soon became apparent that these could not always be demonstrated. Under these circumstances partial pancreatectomies were performed with a view toward removing enough of the secreting islets to leave just sufficient structures for carrying on normal metabolic activities.

That these were not successful can now be readily understood in the light of our present knowledge.

The literature contains several such references. At the Mayo Clinic, Judd[13] with others cited eight cases in which the patients had been operated upon for supposed adenoma. In four of these adenoma was not demonstrated and partial pancreatectomies were carried out. However, this did not relieve the patient's symptoms. Obviously the portions of pancreas removed were too small. Similarly Finney and Finney,[14] in 1928, reported a case of pancreatectomy in which symptoms were

not relieved. They estimated that about two-thirds of the pancreas was removed. In the text of their paper the actual amount

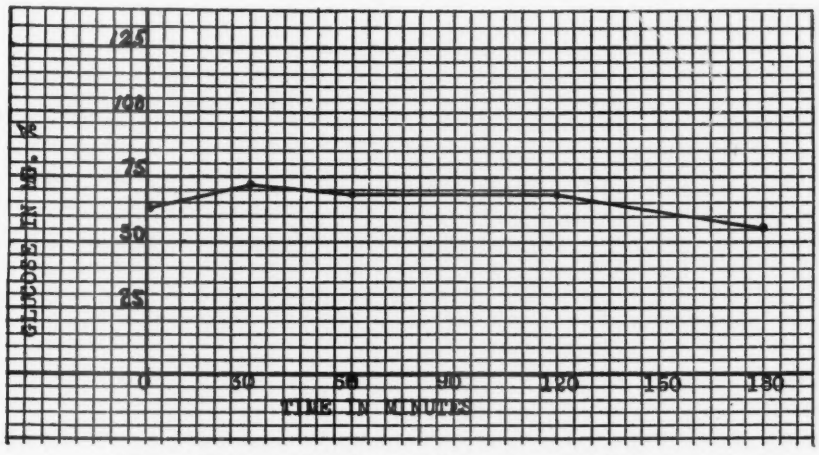

Fig. 1. Preoperative glucose tolerance curve—flat type.

of tissue removed was only 22.5 Gm. Again the amount of tissue removed was presumably insufficient to anticipate relief from the hypoglycemia.

On the other hand, in 1934, Evarts Graham and Hartman[15] cite a case wherein subtotal resection of the pancreas was carried out in an infant age twelve months, with apparent complete relief of symptoms. Laparotomy was performed with tumor in mind. Dr. Graham estimated that about 80 to 90 per cent of the pancreas was removed. Surprisingly enough, microscopic study carried out by Dr. J. L. O'Leary revealed a relatively normal pancreas throughout. This is in contradistinction to the oft repeated findings of islet cell hypertrophy and hyperplasia so generally reported in similar cases.

In this communication Graham remarks about the analogy between hyperinsulinism and hyperthyroidism, an idea originally advanced by Wilder.[16] Based on the improved results in thyroid surgery with more radical removal of thyroid tissue in the hyperthyroid state he points out the necessity for carrying out a similar rationale in the pancreas in which an adenoma cannot be demonstrated. With this in mind he further comments that partial pancreatectomy would not be likely to result in permanent improvement. Hence the rather unfavorable results in the aforementioned cases in which apparently too little pancreatic tissue was removed. Since Graham's case was reported other subtotal pancreatectomies have been successfully performed. Those performed up to 1935 have been concisely tabulated by Whipple and Frantz.[17] V. David,[18] in a review of the literature on pancreatectomy for hyperinsulinism reported up to 1940 this procedure had been carried out only thirty-five times. He further adds that of these subtotal resection was done only seventeen times.

Now subtotal pancreatectomy is widely accepted if an adenoma is not demonstrated. In conjunction with this, David[19] states that four-fifths of the gland should be removed. This, he further points out, should represent about 48 to 72 Gm. of tissue if good results are to be anticipated.

The following case is presented to reemphasize that: (1) The pancreas can be approached with relative ease. (2) Good results may be expected if enough tissue is removed, even if adenoma is not demonstrated. (3) A relatively smooth postoperative course is not uncommon. (4) The physiology of the pancreas is apparently not remarkably altered. (Though the factor of fatty degeneration of the liver occurring late postoperatively must be considered.)

CASE REPORT

The patient, a white male age forty-three, a farmer, was admitted to the Veterans Hospital, Portland, Oregon, on July 1, 1943. His past history was significant in that he has a daughter, age twenty-two, with diabetes mellitus, which began when she was ten years of age. The patient also has a niece, now age sixteen, who at the age of eight had convulsions, which occurred on and off for several months. She was studied at a large hospital in Los Angeles and it was there stated that these convulsions were thought to be due to hypoglycemia. Apparently these were controlled entirely by diet, as they subsided after several months and the niece has not had any further symptoms. The only other significant element in the past history is that at the age of sixteen the patient had a severe electrical shock with a period of unconsciousness. He apparently completely recovered from this.

On admission the patient stated that he was in relatively good health until four years ago, February, 1938, when he suddenly developed sensations of weakness, giddiness and faintness. This was accompanied by marked sweating and tremor. He added that he had been doing relatively hard work that morning consisting of excessive physical labor, viz., chopping and digging on his farm. The "attack" occurred at about 11:30 A.M. This episode lasted about twenty minutes and then subsided spontaneously. He was then fairly comfortable for about ten days when he again experienced another similar episode, this time occurring about 4:30 in the afternoon. This occurred on a Sunday when he hadn't engaged in much work. He stated, however, that he had missed his lunch that day. Again the attack subsided spontaneously in about twenty minutes, before the evening meal was eaten.

Following these two episodes, he had similar ones from then on at intervals of one to two weeks with relative regularity. He continued in this way for several months when it suddenly occurred to him that with these spells, he would become quite hungry, and so he tried eating something, the first time eating bread, butter, and drinking a glass of milk. He noted that his symptoms were promptly relieved. After this when the attacks would occur, and they occurred at either 11:00 in the morning or 4:30 in the afternoon, he would eat and get relief.

About three months after the onset of his attacks, he went to see a local doctor, who, because of the marked weakness and pain in his legs told the patient that he probably had prostate trouble and treated him intermittently the next three months. His attacks continued to occur as previously, however.

He continued in this way for several more months and then saw another local physician who informed the patient that he had "adrenal insufficiency." Accordingly he was given first adrenalin, then benzedrine and sodium chloride, and shortly thereafter, thyroid extract. The patient stated that he was given adrenalin by hypo during several of his attacks and experienced almost instantaneous relief. He was then carried along on benzedrine therapy for nearly one year with indifferent effect. His attacks continued.

During this time his attacks occurred primarily in the mornings, and he stated that the benzedrine did pep him up. At the end of another year, he consulted another physician who told him that he was probably suffering from hypoglycemia. Blood sugar drawn at this time was found to be 64 mg. per cent. Following this, his physician advised him to take sugar on arising in the morning and more sugar if he should have the attacks, and also recommended that he eat candies and sweets between meals.

Under this regime, the patient seemed to get along fairly well and found that his attacks would be quickly aborted this way. As time went on, he found that it became necessary for him to take increasingly larger doses of sweets and sugars in order to stop his attacks. At this time, about the third year of his illness, the attacks occurred every morning and every afternoon daily, and the patient before long noticed that in addition to his symptoms of sweating, body tremor, and marked weakness, he began to become mentally dulled and befogged with his attacks. It was difficult for him to concentrate and he was disinterested. Still later, he noticed that this mental stupor and fogging persisted all day long, even after the attack had subsided. More recently, his inability to concentrate and a cloudy, hazy mental feeling have been predominate symptoms and constantly present.

He stated that there was a change in his attitude and personality, that he was entirely different from the way he used to be and could not do his work. He had been unable to do practically any work for the past six months.

Prior to admission, he stated that in addition to the high carbohydrate diet which he was on, he was ingesting a full pound of sugar a day in order to control his attacks. He denied having any actual convulsions. He further stated that at times if he would eat a noon meal high in protein and relatively low in carbohydrate the symptoms of the morning attack would carry over to the post lunch period. This, on the surface, would give the impression that the attack came on after meals, but actually it initiated prior to the meal and was not completely relieved by it inasmuch as there was apparently not enough carbohydrate in his diet.

Prior to admission to the hospital, he had been taking a pound of sugar divided into four doses at 5:00 A.M., 9:10 A.M., 3:00 P.M., and 9:00 P.M. Despite his confused feeling and lethargy, he was able to be up. His weight which had earlier dropped about thirty pounds was restored to his normal weight of 170 pounds after taking sugar over a six-month period.

Physical examination disclosed a well developed, sick looking, well nourished white male forty-three years of age, whose physical findings were not remarkable with the exception of a blood pressure of 96/84. The abdomen showed no masses, tenderness or rigidity. Laboratory examination: red blood cells 4,340,000, hemoglobin 85 per cent, white blood cells 8,300, differential normal. The urine was free of sugar, acetone and other pathologic components. A fasting blood sugar on July 2, 1943 was 66.6 mg. per cent with a blood urea nitrogen of 16.8 mg. per cent. Blood sugar repeated in several days was 64 mg. per cent in the fasting state. Stools showed no fat to be present. Tests for liver function: Cephalin cholesterol flocculation negative. Takata ara test negative; basal metabolism rate minus 2. Glucose tolerance on July 7th showed a flat type of curve with a fasting level of 64½ mg. per cent and a level of 55 mg. per cent after three hours. The peak level was reached in one-half hour and was 71.4 mg. per cent. (Fig. 1.) A follow-up intravenous glucose tolerance was done for diadactic reasons. Here 25 Gm. of glucose were given intravenously. The maximum level was obtained in five minutes and was 181.8 mg. per cent. In one-half hour the level was down to 74.1 mg. per cent. In one hour the level was 62.5 mg. per cent. A preoperative blood amylase determination was 66.7 units. (Normal 80 to 120 units.) Roentgen data: Gastrointestinal series normal; scout film of the abdomen essentially normal. Radiographs of the skull disclosed a normal sella turcica. Serology: Wassermann and Kahn tests negative.

Based on the above data with a relatively typical history of hypoglycemia in a patient who prior to the onset of attacks was perfectly normal, with an intolerance for fasting and a post-absorptive blood sugar as low as 55 mg. per cent, we believed that we were dealing with organic hyperinsulinism probably due to a pancreatic adenoma. Hence a laparotomy was recommended with a view toward resecting a possible adenoma of the pancreas, or a subtotal pancreatectomy if one could not be demonstrated.

On August 4, 1943, laparotomy was carried out by the senior author under spinal anesthesia (pontocaine and novocaine) supplemented by cyclopropane. At the outset an intravenous infusion of 5 per cent glucose was started. An inverse L-shaped incision with transverse section of the left rectus muscle was made in the left upper quadrant. The surgical report was essentially as follows: Following the preliminary incision the abdomen was entered and the gastrocolic omentum opened. The stomach was seen to be moderate in size. The liver was normal in size, color and texture. The gallbladder was rather small, flaccid and thin-walled. The structures in the duodenohepatic ligament felt normal. Careful palpation of the pancreas beginning laterally in the region of the spleen and progressing medialward to include the head failed to disclose any abnormalities. The pancreas appeared normal in color and texture and the size was normal. It was not abnormally fixed nor deformed. The spleen was of average size. The transverse colon and small bowel appeared normal. The omentum was voluminous. Following this general investigation the retrogastric space was further exposed and the pancreas was traced laterally and the entire pancreas well exposed from the region of the spleen to and including most of the head. The peritoneal reflection along the inferior border of the organ was incised and further palpation carried out which further demonstrated that no tumor masses were palpable. Under the circumstances the tail and body of the pancreas were then resected. During the course of this, troublesome venous bleeding occurred in the region of the

spleen. This was controlled with several suture ligatures. The dissection of the tail and body was then readily continued medialward, clamping, cutting and ligating small bleeders en route with black silk. When the region of the neck of the pancreas was reached, it was well differentiated by careful dissection. Next a No. 2 chromic ligature was tied about the organ at this point and the body including the tail was resected. The stump was whipped through with numerous No. 0 silk mattress sutures. Further investigation in the region of the splenic pedicle disclosed some venous bleeding which was not readily controlled. Accordingly a 3 inch gauze pack was placed in that region and brought out at the lateral angle of the abdominal incision to control bleeding. Along with this a large empty Penrose drain was placed down to the pancreatic bed. Prior to this, 5 Gm. of sterile sulfanilamide crystals were frosted into the depths of the wound. The wound was closed in the usual manner with 2 additional Gm. of sterile sulfathiazole powder frosted into the subcutaneous wound prior to closure of the skin. The immediate postoperative condition was good, but as a general supportive measure he was given a 500 cc. blood transfusion.

The specimen of pancreas removed and submitted to Dr. F. R. Menne, of the Department of Pathology of the University of Oregon Medical School, revealed the following: Gross findings: The pancreas has the usual lobulated appearance, it is not unusually firm. The surfaces made by sectioning it reveal no marked variation in structure. Sections are selected for microscopic study. Microscopic findings: Microsections of the pancreas reveal the usual lobular arrangement. The lobular structures being demarcated by narrow bands of fibrous connective tissue. The acinar arrangement is regular. The islets of Langerhans vary considerably in size. They do not appear to be especially numerous. They possess a prominent vascularity. The cytoplasm of the cells tends to stay neutrophylic. The islets not infrequently present some evidence of elongation and in certain sections appear to be present in increased numbers, five such structures being seen under low power field. In still other sections the islets are quite large and apparently are highly vascular. Pathologic Diagnosis: Normal pancreas with possible hypertrophy and hyperfunctioning of the islets.

Postoperatively, the patient's course was relatively uneventful for the first two or three days. His blood sugar did not go beyond 200 mg. per cent during the first twenty-four hours and there was only very slight glycosuria. He was given 2,000 cc. of 5 per cent glucose in normal saline immediately postoperatively. Later on, as a general anti-shock measure he was given 250 cc. of human serum intravenously, and oxygen was administered by B.L.B. mask. His general condition was very good, however. At 1:30 P.M. his blood sugar was 192 mg. per cent. At 4:00 P.M. it was 200 mg. per cent, at 5:45 there was slight glycosuria and he was given ten units of regular insulin. At 10:00 P.M. the blood sugar was 114 mg. per cent and his urine showed slight glycosuria. The following morning his fasting sugar was normal—119.7 mg. per cent. Later in the day the blood sugar went to 173.9 mg. per cent as a maximum. At 4 P.M. it was 111 mg. per cent. The patient's condition remained very good. By the second or third postoperative day although his condition was good he began to vomit small amounts of clear fluid. His stomach was washed out and he felt relieved, but this continued on and off for the next few days. At no time did he have any acetone in his urine. After a few days his blood sugar stayed at normal levels continuously. (Table 1.)

TABLE 1
POSTOPERATIVE BLOOD SUGAR DETERMINATIONS

Day of Surgery 8-4-43	Blood Sugar Level (Mg. Per Cent)			
	8:00 A.M.	11:00 A.M.	4:00 P.M.	10:00 P.M.
8-4-43	.....	.....	200	114.9
8-5-43	119.7	173.9	111	
8-6-43	108.1	95.2		
8-7-43	95.2	125		
8-13-43	108.7			
8-18-43	118			
8-23-43	100			
9-3-43	90.9			

His glycosuria subsided completely. Although the slight vomiting was somewhat troublesome for several days it soon subsided spontaneously. On the third postoperative day the patient was able to take tea and broth and by the fifth postoperative day was on light feedings. He then continued quite comfortable for several more days. During this time the pack was removed. Shortly before the pack was

completely removed the patient began to drain moderately and soon thereafter developed some left epigastric pain. A serum amylase taken at this time was 47.6 units. The possibility of a subacute pancreatitis was considered but rejected. Pain later subsided spontaneously. Following this the patient's course was relatively smooth and uneventful and the pack was completely removed. He had, however, continued to drain a moderate amount of seropurulent material. The abdomen was soft and not tender. After two-and-one-half weeks he was able to be up and about, and stated that he was perfectly comfortable and felt fine. The nervousness and jitteriness had completely gone. He was able to concentrate. His head did not feel clouded and befogged. Following surgery he had no recurrence whatever of any of his previous attacks. Follow-up laboratory studies disclosed fasting blood sugars which were normal. A glucose tolerance test done on September 8, 1943, was normal as follows:

GLUCOSE TOLERANCE TEST

	Blood Sugar	Urine Sugar	Acetone Diacetic Acid
Fasting state—before starting test	76 mg.	Neg.	Neg.
Given 100 Gm. of glucose by mouth			
½ hour after glucose	116.3 mg.	Neg.	Neg.
1 hour after glucose	125 mg.	Neg.	Neg.
2 hours after glucose	96.1 mg.	Neg.	Neg.
3 hours after glucose	73 mg.	Neg.	Neg.

A blood amylase on September 9th was seventy-five units. Serum albumin globulin 5.8 mg. per cent/2.8 mg. per cent. Cephalin cholesterol flocculation test of liver function was negative. Blood cholesterol was 154 mg. per cent. Takata ara test negative; icteric index 7. He was discharged on September 9, 1943 feeling fine. The wound was well healed with the exception of a minimal amount of drainage from the lower aspect. This was to be dressed by his local physician.

COMMENT

This case represents another instance in which a pancreatic adenoma was strongly anticipated but not found. An extensive subtotal pancreatectomy was carried out with apparently good results. The patient is markedly improved. By his own statement he feels entirely different and more normal. His fasting blood sugar is now normal as is his dextrose tolerance curve.

We believe one of the principal reasons for the result obtained here was resection of sufficient pancreatic tissue. As previously indicated too little tissue had been removed in other reports and hence no improvement resulted. This undoubtedly explains the pessimistic attitude of various surgeons toward pancreatectomy. Up to 1935, MacCaughan[2] reported that the greatest amount of tissue removed was 60 Gm. In this case 65½ Gm. of pancreas was removed. Rockey[21] states that the tendency at the Mayo Clinic at present is to remove even larger amounts of pancreas than this.

Of special interest here is the fact that the histologic character of the pancreas was not markedly abnormal. If this is so, this case would fall in the category of those wherein there is a hyperfunctioning total pancreas similar to the hyperthyroid state. That removal of even perfectly normal pancreas can result in marked improvement in these cases was referred to above in the case of Graham and Hartman.[22] It would appear that this case represents another in the same category. Review of the histology with respect to the average size of the islets in the pancreas discloses them to average 130 by 90 microns. This is compared to normal measurements of about 157 by 146 microns stated by MacCallum[23] to be average. Hence we can see that there is no real hypertrophy of the islets here. Wilder,[24] however, emphasizes the problem in determining the size of the islets and the inconstancy noted in the size of the islets in patients with no evidence of hyperinsulinism. He concludes obviously that it is not wise then to depend too much upon the size of the islets.

Of considerable interest is the matter of surgical technic. We believe that the significance of guarding against injury of the

splenic vein should be emphasized. It appears that although this point has been touched on in the past by previous writers, this relatively great hazard is not adequately pointed out. McCaugham[25] states that the most important step in the operation consists of passing a temporary tape ligature about the splenic vein and artery. This serves the double purpose of providing traction if the vessels are injured and also for displaying them more prominently. He further points out that the pancreas is far more intimately attached to these vessels, especially the vein, than illustrations in most textbooks would lead one to believe.

In conjunction with surgical technic, the subject of splenectomy arises. It is debatable as to whether or not it is desirable to carry out a splenectomy as a preliminary procedure. Holman,[26] and Thomasen[27] have advocated routine removal of the spleen as being a big aid in the technic. However, in the more recent literature, this procedure has not been found to be necessary. There was a strong temptation to carry out a splenectomy here, inasmuch as the splenic vessels were injured. It was believed, however, that the additional shock of splenectomy might be too much for the patient, hence the idea was rejected, and bleeding was adequately controlled by packing.

In addition to the above it appears from the literature that the best procedure for removing the pancreas is by immobilizing the tail first and then proceeding from the lateral aspect to the mid-line. The senior author wholeheartedly believes that in carrying out such a procedure again it would be wiser and easier to transect the pancreas in the vicinity of the superior mesenteric vessels and then proceed to resect the pancreas from this point toward the tail. He is of the opinion that this would simplify the procedure considerably.

Another interesting feature that has received wide comment has been the occurrence of postoperative pancreatic fistula. This not infrequently occurs. However, contrary to popular belief, pancreatic juice as it comes from the pancreas itself is not irritating to the skin. It is only when it becomes secondarily infected that skin irritation arises and becomes a problem. This is emphasized by Luckhardt,[28] and Elman and MacCaugham.[29] In our case the patient developed moderate postoperative drainage. This was probably not a pancreatic fistula but rather a consequence of low-grade secondary infection due to the packing. It was never very troublesome and there was definitely no excoriation of the skin.

Last, while this patient has made a splendid symptomatic recovery, we are obviously not prepared to say as to how he will fare later. We, of course, refer to the possibility of fatty infiltration of the liver ensuing. There has been considerable debate as to whether or not this always occurs. As a general premise, it probably does not arise if sufficient pancreas is left so that external pancreatic secretion enters the gastrointestinal tract. This can be readily determined. Another aid in determining whether or not this will occur is the presence or absence of diabetes mellitus occurring postoperatively. It appears that if diabetes does not persist fatty infiltration will probably not develop. This is borne out in many diabetic patients who develop fatty infiltration of the liver if their diabetes is not adequately controlled. In the event that fatty infiltration should appear, it now appears that this can be controlled. Draegstedt[30] and his co-workers have isolated lipocaiac, a substance which is supposed to prevent fatty infiltration in depancreatized dogs receiving insulin. That this always accomplishes such an objective in humans has not been conclusively borne out, however. Pancreatin, that is, whole pancreatic extract seems to be an adequate substance for carrying on relatively normal pancreatic digestion in the gastrointestinal tract if the remaining pancreas is unable to do so. It is indicated if fatty diarrhea or pancreatic achylia supervenes.

In conclusion, it is believed that this case represents another instance of marked

improvement of the hypoglycemic state by subtotal resection of relatively normal appearing but probably hyperfunctioning pancreatic tissue.

SUMMARY

1. A case is presented in which the hypoglycemic state probably produced by organic hyperinsulinism was apparently cured by subtotal pancreatectomy.

2. The diagnostic problems encountered in the hypoglycemic state are considered. The significance of the glucose tolerance curve is evaluated.

3. The need for "adequate" subtotal pancreatectomy is re-emphasized.

4. Some of the surgical pitfalls and postoperative problems are discussed.

5. The appearance of fatty infiltration of the liver as a possible late sequel of surgery is pointed out.

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HEMORRHOIDS

SURGICAL VERSUS INJECTION TREATMENT

DAVID N. YAKER, M.D.
Attending Proctologist, Cedars of Lebanon Hospital
LOS ANGELES, CALIFORNIA

THE fundamentals of proctology are overlooked in most of our medical schools. Very few have a Department of Proctology with the result that the medical student leaves school with little or no knowledge of this subject. Further, in most teaching hospitals, there is no Department of Proctology; in these hospitals general surgery embodies proctology and no special emphasis is placed on this subject.

Much has been written on the injection treatment of hemorrhoids. The medical student, graduate physician and even laymen have heard about the non-operative or injection treatment of hemorrhoids. Our newspapers carry any advertisement as long as there is some revenue in it, as evidenced by the number of these advertisements which the laymen just cannot miss, and which tell how piles and fistulas can be cured without surgery and "while you work"; even our classified telephone directory carries the advertisements of these "sure-shots" one of which has two separate advertisements: "Get Piles Absorbed While You Work" and "Tonsils Removed While You Work." The layman should consider himself fortunate in that he is not further confused by one who might get on the radio and tell how he can cure rectal diseases without surgery; however, I may be a bit premature in this.

The subject to be discussed here is the surgical versus injection treatment of hemorrhoids. This title in itself is somewhat misleading, as it will be pointed out that there is really no controversy in the treatment of hemorrhoids. Injection therapy has its place as does surgery. Controversy does arise in those cases in which the proper therapy has not been selected in certain cases; and the mistake is general in that injection therapy is administered in those cases in which surgery is a proper treatment.

It is taken for granted that other pathological conditions are ruled out in the patient by sigmoidoscopic examination and *x*-ray examination, and that the diagnosis of hemorrhoids has been conclusively arrived at.

The treatment of hemorrhoids depends entirely upon the type of hemorrhoids found. Hemorrhoids can be placed under three classifications: (1) internal, (2) external, and (3) mixed or externo-internal hemorrhoids and skin tags.

Internal hemorrhoids are varicosities of one or more branches of the superior hemorrhoidal veins. They are always located above the dentate line or anorectal margin and are covered by mucous membrane. The first symptom of internal hemorrhoids is bleeding; later on, as they increase in size, they protrude on bowel movement and, upon contraction of the sphincter they will reduce themselves; however, as they get larger, they may have to be reduced manually. These hemorrhoids do not produce pain unless thrombosed or strangulated and accompanied by edema of the anal skin; they do produce a slight bit of discomfort when they protrude. Moisture may be produced by the frequent prolapse and a subsequent irritation of the anal mucosa, with a resulting deposit of mucus on the perianal skin. Upon examination these hemorrhoids, unless they are protruding, are seen through the speculum; there may be as many as eight and as few as one, but, as a rule, there are three internal hemorrhoids; one right anterior, one

right posterior, and one left lateral according to the distribution of the superior hemorrhoidal veins.[1] Again, it must be emphasized that these internal hemorrhoids are situated above the anorectal margin. If these hemorrhoids are accompanied by pain, one must look for the presence of a fissure, abscess, or even a foreign body which may have become lodged in one of the anal crypts. These simple, uncomplicated hemorrhoids are the only ones that will respond successfully to the injection or non-surgical treatment. If one remembers this fact and adheres to it, he will be saved many moments of anxiety and embarrassment.

It makes very little difference as to the injection fluid, whether it be quinine and urea, or mild phenol solutions, as good results have been obtained with both. The injection should be made high, almost at the base of the hemorrhoid, and just beneath the mucosa. The amount injected can be best determined by the appearance of the mucous membrane, but one should not inject enough to produce blanching as that might produce a subsequent slough. If properly given, an injection should produce very little if any pain. Injections can be given two or three times weekly, preferably once a week, and when symptoms are relieved, the intervals between the injections can be lengthened. As a rule, ten to twelve injections should take care of the average case. The patient should be examined every six months or year to make sure recurrences do not take place. If internal hemorrhoids are strangulated and cannot be reduced, they should be operated upon at once. And again, it must be stressed that if internal hemorrhoids are complicated by other anorectal disorders, such as cryptitis, papillitis, polyp, fissure, abscess, they should be treated surgically.

External hemorrhoids can be described as those situated below the anorectal margin, and are varicosities of the inferior hemorrhoidal veins. They are covered by anal skin. These hemorrhoids may be either cutaneous or skin-tags, thrombotic or simple varicosities. Symptoms of external hemorrhoids or mixed hemorrhoids are the same as those of the internal but with the addition of the constant presence of protrusions. There is only one treatment for external hemorrhoids and that is surgical.

It is in the treatment of the mixed type or externo-internal hemorrhoids that the question of therapy arises. These hemorrhoids have their swelling on the mucocutaneous junction, the upper half of the hemorrhoid being lined by mucous membrane and the lower half by skin. From personal experience and from that of other proctologists, injection therapy in these cases will give some temporary relief; it will hold up and reduce the size of the internal part of the hemorrhoid for a very short while, and may even stop the bleeding. But the external part remains and the internal will form again. It is in these cases that recurrences will inevitably occur following injection treatment. It is in this type of case that there is some debate as to therapy injection or surgery; and it is the belief of most proctologists, and I say without fear of being contradicted, that surgery is the therapy of choice. Time and again patients have been examined and give a history of having had injection therapy, and, almost invariably, the examination reveals externo-internal hemorrhoids. Of course, it is understood, that in those cases in which surgery is contraindicated an attempt should be made to give the patient relief by injections; and even in those cases with anaesthesia on a safe level that it is today, some patients will respond more readily to surgery than they will to a prolonged series of injections. The late Norman Kilbourne,[2] in a statistical study of hemorrhoids gathered from data given him by many proctologists all over the world, reported 0.5 per cent recurrences or 148 cases following 29,425 hemorrhoidectomies, and 290 cases or 15.14 per cent in 1915 cases for injection; the author believes that these recurrences very likely took place in those cases in which attempts had been made to treat externo-internal hemorrhoids with injections.

Gabriel[3] states that as a result of increasing experience he has become extremely cautious about injecting externo-internal piles because of the recurrences and advises surgery in these cases. He further states that he used to treat, by the injection method, about 75 per cent of all patients with hemorrhoids but, at the present time, he is only treating 50 per cent and this is quite a concession on the part of Gabriel, who, primarily a surgeon and a good one, is very conservative in the treatment of anorectal ailments.

CONCLUSION

In the opinion of the author, there is no debatable question in the treatment of hemorrhoids. Good results are being obtained following injection therapy in selected cases. Good results are obtained following surgery. One must bear in mind that only the simple uncomplicated internal hemorrhoids will respond successfully to injection treatment, and that external hemorrhoids and mixed hemorrhoids will be relieved successfully by surgery only.

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Biopsy is a most important diagnostic procedure when granulomatous or adenomatous masses in the rectum of doubtful etiology are met with, and in the case of strictures which clinically might be inflammatory or due to a diffuse carcinoma.

SOME USES FOR HEAVY ANESTHETIC OILS

LIEUT. COL. HARRY M. KIRSCHBAUM
MEDICAL CORPS, ARMY OF THE UNITED STATES

EXPERIENCE at orthopedic sick-call at the Station Hospital, shows that one-fifth of the patients complain of backache. Since backache, or low back pain, are merely symptoms, it follows that proper treatment can be based only on a careful evaluation of the etiology of these pains. In order to ascertain the etiology, we have established the following routine: (1) Careful history with special attention to the location of pain, its nature, and path of radiation; (2) physical examination, observing especially the effects of the various motions of the back, and (3) *x*-ray studies, including the oblique views.

The *x*-ray studies rarely indicate the etiologic lesion. The reason for this can be plainly understood when one is reminded of the very complex ligamentous attachments of the lumbar, lumbosacral, and the sacro-iliac joints, as demonstrated in Figures 1 to 5. Diagnostic significance of observing the effect of back movement during the physical examination was described by Steindler in 1925. He made the observation that the large majority of cases of low back pain, due to mechanical causes are primarily ligament strains with demonstrable rupture of the ligament accompanied by extravasation of blood and subsequent scar formation. He studied 213 cases and made the following conclusions: "(1) Flexion increases the strain and stress in the posterior sacro-iliac ligaments, the erector spinae muscles, and their aponeuroses. (2) Extension increases strain at the lateral ligaments between the ilia and the transverse processes of the fifth lumbar vertebra. (3) In lateral bending the roots of the lumbosacral plexus are relaxed on the concave side and tensed on the convex side. (4) Increased lordosis produces tension of the sympathetic plexus and ganglia."

The author had occasion, during many years of practice as a gynecologist, to see a great many patients whose chief symptom was backache. These cases were usually thoroughly studied, including gynecologic survey, *x*-ray examination of the pelvis and the sacral region, the study of the genitourinary tract and a colonic study, including sigmoidoscopy and the barium enema. If no gynecologic disorder was discovered, the case was referred to an orthopedist for management. Too often these patients received routine treatment such as heat, massage and a sacro-iliac belt, with no improvement, or a fleeting improvement.

In the management of such cases the measures and technics commonly employed in the diagnosis and treatment of back pain were scrupulously observed. A search was made for foci of infection. Here it is interesting to point out that many a case of otherwise intractable back pain disappears almost miraculously after the extraction of an abscessed tooth. Physiotherapy measures, such as shortwave, massage and the use of the heat lamps, were employed extensively as were exercises for stretching the legs and traction. The use of these measures, combined with diligent care in searching for the exact etiology, was productive of a considerable degree of cure of pain and disorders in many cases which would otherwise have been unimproved. The problem that was particularly perplexing, however, was that of relieving severe lancinating backache which is usually localized to the upper sacro-iliac joint and cases of severe pain at the region of the coccyx. The method of injection with the usual local anesthetics was tried but proved unsatisfactory because, in most cases, the pain returned within two or three hours after the injec-

tion. The manipulation treatment described by Jostes, of Kansas, was routinely tried and many patients were relieved by this method without further treatment. However, this method requires a great amount of physical strength on the part of the physician, and is ineffective when the patient is stout or otherwise hard to manipulate.

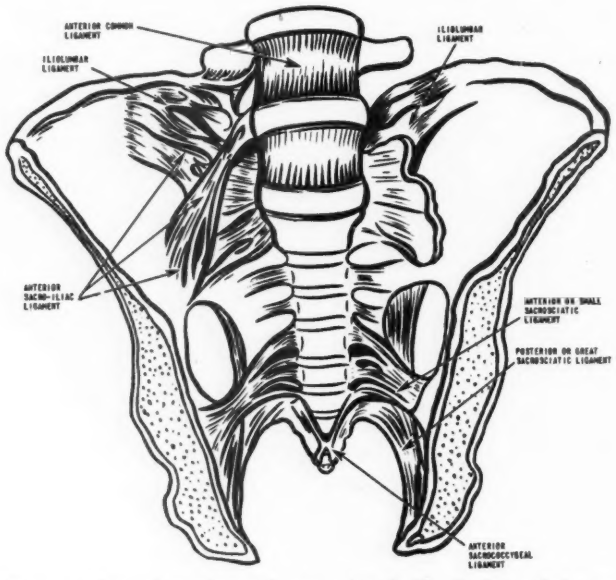

Fig. 1. Anterior view of posterior half of the pelvis to demonstrate the ligaments of the sacro-iliac joint. (Redrawn from Toldt's "Atlas of Human Anatomy," vol. 1, 1928. The Macmillan Company.)

In searching for a method which would give positive relief to a larger number of patients, I finally resorted to the injection of heavy anesthetic oils. The chemical composition is as follows:

Benzyl alcohol	4	1–6%
Procaine base	1	1–4%
Isocaine C. P. Co (Isobythl-para-amino-benzoate)	4	1–6%
Almond oil (sweet qz. 100%)		

This method was uniformly satisfactory during my civilian practice and has been used by me in the treatment of a considerable number of cases of backache in military personnel. The immediate and lasting relief obtained is most gratifying and prompts me to detail the technic:

Particular attention is paid to the site of greatest tenderness of the back. If the pain is most severe at the attachment of the iliolumbar muscles to the ilium, 5 cc. of the anesthetic oil are injected at the site. If the pain is very diffuse over the entire sacrum 15 cc. of the oil are injected over the sacrum. With pain along the sacroiliac joint 10 cc. of the oil are injected along the ligamentous attachments of the sacroiliac joint. In severe cases with radiation to the buttocks 1 cc. of oil may be injected into each sacral foramen as in transsacral anesthesia.

In coccydynia a small amount of procaine, 2 per cent, is injected around the coccyx and then 10 cc. of anesthetic oil is used to inject completely around the coccyx surrounding the coccyx bone. After the injection, the coccygeal muscles are massaged after Thiele. In sciatica 10 cc. of the anesthetic oil is injected in the nerve sheath with prompt relief. In very severe cases this is combined with stretching of the sciatic nerve by extending the leg at the knee and throwing the leg over the shoulder, under anesthesia. It was found that the intravenous anesthesias did not give sufficient relaxation for thorough extension of the knee and flexion of the

thigh on the body of the patient. For that reason ether anesthesia is advised for this procedure.

spinal administration of novocaine. There were no untoward effects from this injection. In fact, on four occasions I have in-

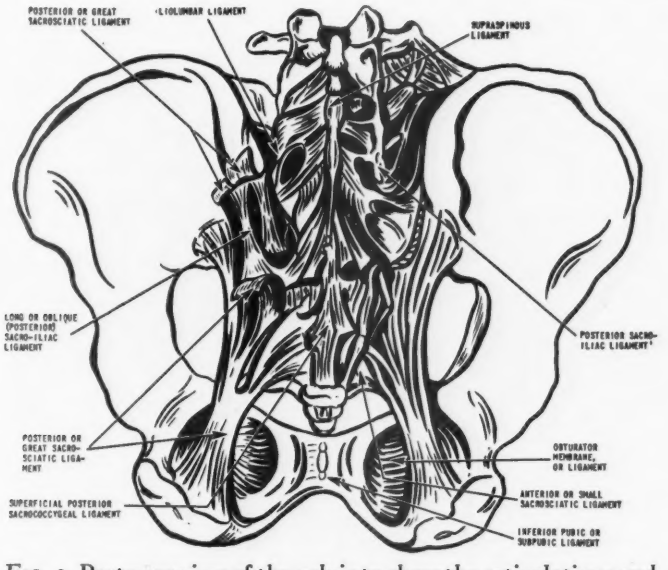
POSTERIOR OR GREAT SACROSCIATIC LIGAMENT
ILIOLUMBAR LIGAMENT
SUPRASPINOUS LIGAMENT
LONG OR OBLIQUE (POSTERIOR) SACRO-ILIAC LIGAMENT
POSTERIOR SACRO-ILIAC LIGAMENT
POSTERIOR OR GREAT SACRO-SCIATIC LIGAMENT
OBTURATOR MEMBRANE, OR LIGAMENT
ANTERIOR OR SMALL SACROSCIATIC LIGAMENT
SUPERFICIAL POSTERIOR SACROCOCCYGEAL LIGAMENT
INFERIOR PUBIC OR SUBPUBIC LIGAMENT

FIG. 2. Posterior view of the pelvis to show the articulations and ligaments of the pelvic girdle. (Redrawn from Toldt's "Atlas of Human Anatomy," vol. 1, 1928. The Macmillan Company.)

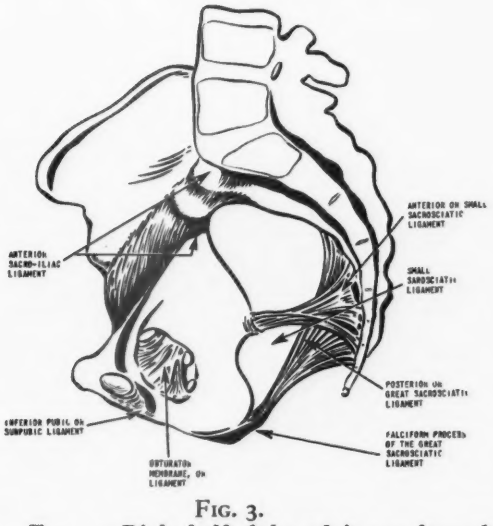
ANTERIOR OR SMALL SACROSCIATIC LIGAMENT
ANTERIOR SACRO-ILIAC LIGAMENT
SMALL SACROSCIATIC LIGAMENT
POSTERIOR OR GREAT SACROSCIATIC LIGAMENT
INFERIOR PUBIC OR SUBPUBIC LIGAMENT
FALCIFORM PROCESS OF THE GREAT SACROSCIATIC LIGAMENT
OBTURATOR MEMBRANE, OR LIGAMENT

FIG. 3.

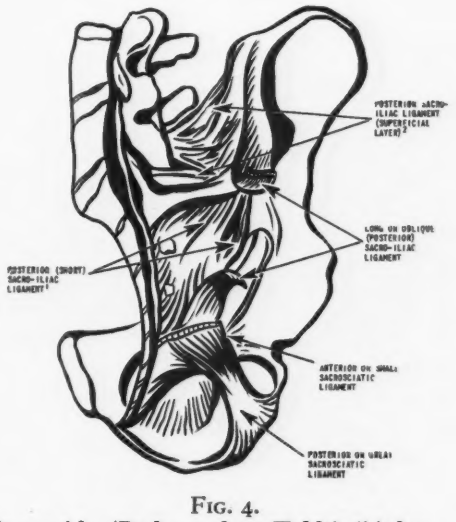
POSTERIOR SACRO-ILIAC LIGAMENT (SUPERFICIAL LAYER)
LONG OR OBLIQUE (POSTERIOR) SACRO-ILIAC LIGAMENT
POSTERIOR (SHORT) SACRO-ILIAC LIGAMENT
ANTERIOR OR SMALL SACROSCIATIC LIGAMENT
POSTERIOR OR GREAT SACROSCIATIC LIGAMENT

FIG. 4.

FIG. 3.—Right half of the pelvis seen from the inner side. (Redrawn from Toldt's "Atlas of Human Anatomy," vol. 1, 1928. The Macmillan Company.)

FIG. 4. Right half of the pelvis divided in the median plane; postero-internal aspect. (Redrawn from Toldt's "Atlas of Human Anatomy," vol. 1, 1928. The Macmillan Company.)

In some of the back injuries in which the pain is diffuse and radiated through the buttocks, 4 to 6 cc. of the anesthetic oil are injected into the caudal canal. This method could also be used in anesthesia during labor instead of the continuous

jected 1 cc. of anesthetic oil into the spinal canal in cases of advanced carcinoma with resulting marked improvement of the severe pain for ten to twenty days. I have also injected anesthetic oils for paravertebral block in thrombophlebitis. This

should prove of value in cases of peripheral vascular disease instead of repeated injections of procaine, since one injection will suffice for ten days.

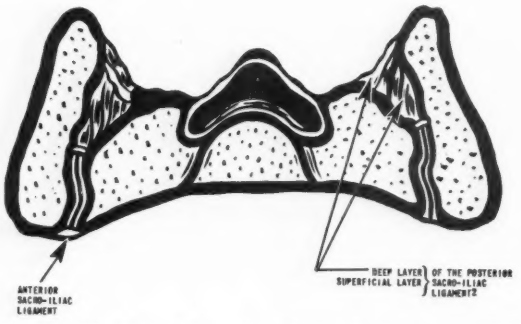

Fig. 5. Horizontal section through the sacro-iliac articulation. (Redrawn from Toldt's "Atlas of Human Anatomy," vol. 1, 1928. The Macmillan Company.)

It is obvious that the manipulative treatment of sacro-iliac strain offers, in the acute case, a valuable method, especially when the patient is thin and easily manipulated. However, in the stout or heavily muscled patient manipulation is extremely difficult. The injection treatment offers, therefore, a ready and easy method for relieving those patients who suffer intensely with sacro-iliac strain. At least it takes them definitely over the acute phase. In those patients who have complained of backache for several years and have lost confidence in the fact that the back is mobile or can be improved, the use of oil giving temporary relief for a period of ten days with immediate motion and exercise gives the patient a certain amount of confidence.

In cases of stiff neck, the neck muscles may be injected with 10 cc. of the anesthetic oil for the relief of severe pain if short-wave treatments do not give prompt relief. One very interesting case was that of severe pain in the interscapular area. The *x*-ray was entirely negative, but injection of heavy anesthetic oil gave complete relief and there has been no recurrence for five weeks.

In severe sprain of the ankle or strain of the shoulder or other joint, the injection of 10 cc. of anesthetic oil instead of the usual 2 per cent procaine solution gives marked relief and permits the patient to walk about without pain for ten days. The injection of procaine alone would last only a few hours, and, therefore, the oil injection is much more satisfactory.

In closing, it is the author's opinion that acute cases of painful back and sacro-iliac pain which do not respond to manipulation, or in which manipulation is impractical, can very often be relieved promptly by the injection of heavy oil anesthetic locally. The method which has been described is not advocated as a panacea for the cure of all back pain, and must in all cases be complemented by a careful diagnostic study to outline the pathological condition and to rule out neurologic and other lesions; but when properly used, it will relieve a great many cases of fascial injuries, muscle and ligamentous tears and strains.

SUMMARY

The general management of cases of backache is outlined, stress being placed on an exhaustive diagnostic study. A detailed technic for injection of heavy oil anesthetics is given.

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X-RAY TREATMENT OF SINUSITIS*

FREDERICK T. MUNSON, M.D. AND HENRY T. MUNSON, M.D.
Chief of Staff in Ophthalmology and Otolaryngology, Alexander Blain Hospital
Diplomate of the American Board of Otolaryngology
DETROIT, MICHIGAN

SEVERAL articles have appeared in the past few years on the value of the roentgen ray in the treatment of both acute and chronic sinusitis. All of these impress the reader with the extreme difficulty of evaluating any series of cases along this line. As Kornblum[3] has pointed out: "The extreme variability of the disease, its tendency to spontaneous remissions, and the individual response to infections in general, the complications imposed by allergy, and the marked variation in the anatomical makeup of the sinuses, introduce factors which must enter into the problem of any individual case of sinusitis." We heartily concur in this statement and have experienced considerable difficulty in evaluating our own series.

We believe that the possible psychic effect of radiation must also be strongly considered. Even as early as 1923, Osmond[4] pointed out how several patients were relieved of their sinus pain after the taking of routine radiograms of the sinus. This has been observed by several authors since then, and we have had one or two cases that responded in the same manner.

Is there a good rationale for roentgen ray treatment of the infected sinus membrane? We believe there is, but we also believe that the effect is much more dramatic in an acutely congested lining membrane than in a long-standing, chronic condition with accompanying fibrosis. This statement is not in agreement with most writers on this subject, but we believe it is warranted after observing the almost immediate relief in numerous cases of acute sinusitis. The research of Desjardins[1] has demonstrated the selective response of the various cellular elements of the body to radiation. Thus it is noted that the erythrocytes are quite resistant to radiation, whereas the leucocytes are among the most sensitive cells of the body, the lymphocytes being much more readily affected than the polymorphonuclears. These facts have been confirmed by the recent work of Kornblum.[3] Therefore, in the treatment of any inflammatory membrane (edema, leucocytic infiltration, hyperemia) the principle of the aforementioned "selective response" is brought into play.

Why are symptoms relieved by small amounts of irradiation?

In the *acute* phase of inflammation pain is usually due to stretching of the tiny nerve endings. These are under considerable tension, along with the rest of the structures of the sinus membrane, as inflammatory edema and cellular infiltration have increased the lining membrane ten to twelve times normal thickness. It might be deduced, therefore, that (1) radiation reduces the amount of cellular infiltration slightly by "selective action" on the leucocytes, and (2) radiation increases the vascular supply and drainage to the affected area. These dilated channels should serve to reduce intercellular edema by a sort of reverse osmosis, in which the fluid would re-enter the circulation. Both these factors would reduce the size of the inflamed membrane, and a decrease in tension of the nerve fibrils would accompany this reduction with resultant relief of pain.

In the *chronic* course of the disease process, improvement is probably due to the "selective action" of the *x*-rays on the leucocytes, particularly the lymphocytes,

* From the Department of Otolaryngology, Alexander Blain Hospital, Detroit.

which are found in such large numbers in the typical chronic hyperplastic sinus membrane. The destruction of these lymphocytes, with resultant scarring, will definitely reduce the thickness of the epithelial lining membrane and promote more adequate drainage by relieving the membranous obstruction at the natural sinus ostium.

In the chronic suppurative cases and those with marked polypoid degeneration the response is poor. This fact has been established by practically every authority in this field of research.

In our own series of cases we are markedly impressed by the early relief of pain, even after just one dose of 50 to 100 r to an acutely congested sinus cavity.

A statistical review of our cases is somewhat impractical because of the uncertainty of diagnosis in several cases and an insufficient follow-up in numerous others. In our type of private practice roentgenograms are not obtained in every case. Further, a goodly percentage of patients fail to return to the office once their pain has been relieved.

We believe quite strongly, however, that a high percentage of our patients with acute sinus conditions noted definite cessation of pain in four to six hours. In several instances two, three, and four treatments of 100 r were necessary for relief of symptoms, but these multiple treatments were much more predominant in the subacute and chronic stages of the disease in which pain is an insignificant factor.

As we have inferred earlier in this article, cases of acute sinusitis accompanied by pain and tenderness respond much more readily and dramatically than the chronic types of sinus inflammation. We agree with Williams and Popp[5] that better results are obtained in those cases in which therapy was instituted early in the course of the disease. Williams and Popp were among the first to stress the striking effect of roentgen therapy in acutely inflamed sinuses.

In our own series the following factors were used: 150 K.V.P., 15 M.A., 50 cm. skin target distance, and a filter of ¼ mm. copper plus 1 mm. aluminum. A machine of the General Electric "Maximar 220" type was used throughout. Treatments were given at intervals of two to six days but usually at three-day intervals. The amount of radiation given at each treatment was either 100 r or 150 r.

Of the last twenty patients who have undergone *x*-ray therapy for acute sinus disease eleven noted immediate relief of pain after one treatment, four observed relief after three treatments, while three underwent as many as five to six *x*-ray treatments before cessation of pressure symptoms. In two cases sinus puncture was performed after the first *x*-ray treatment.

Dangers from the Use of X-ray to the Sinuses. 1. The pituitary gland cannot be protected successfully as almost any sinus treatment must necessarily involve this very important structure. We do not know of any well organized research along this line, but the danger of hypophyseal damage should be kept in mind.

2. Normal physiological anatomy of the nasal mucosa may be permanently altered, although Heine has demonstrated that it requires a relatively large dose of *x*-ray to interfere with ciliary activity.

3. Some workers believe that *x*-ray therapy is to be avoided, except in the treatment of malignancy. This is because of the cumulative effect of the rays and resultant complication of treatment at some future date.

Advantages in the Use of X-ray to the Sinuses. The advantages are: (1) early relief of pain in most all cases, and (2) lack of discomfort in mode of treatment. (Many patients object to Proetz displacement and other types of intranasal treatments.)

CONCLUSIONS

1. Small doses of *x*-ray relieve pain in a high percentage of patients with an acute sinus condition.

2. A lesser number of patients with subacute and chronic sinus conditions obtain noticeable subjective improvement after *x*-ray treatment.

3. The relief of symptoms may be attributed to (1) "selective" destruction of leucocytes and (2) increased vascular supply with reduction of intracellular fluid. These two factors tend to reduce the size of the lining membrane and the nerve endings are taken "off the stretch."

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THE presence of adenoids may be inferred by the characteristic facies and proved by palpation. Chronically infected adenoids should be removed, and their removal comes within the scope of minor surgery.

ALAR SCAPULA*

AN UNUSUAL SURGICAL COMPLICATION

COLONEL MANFRED U. PRESCOTT† AND CAPTAIN RICHARD W. ZOLLINGER†
MEDICAL CORPS, ARMY OF THE UNITED STATES
MEDICAL CORPS, ARMY OF THE UNITED STATES

ALAR scapula or winging of the scapula is not a common condition. It was first described by Velpeau[13] in 1825. Berger's[2] original monograph, in 1875, calls attention to the entity. We wish to present two cases that developed winging of the scapula while undergoing therapy for pilonidal cysts.

Anatomy. The serratus anterior muscle and its nerve supply are the structures involved that result in winging of scapula. The serratus anterior is a thin muscle arising by digitations from the external surfaces and upper borders of the first eight or nine ribs, and the aponeuroses covering the intervening intercostal muscles. The muscle extends backward, close to the chest wall and is inserted into the vertebral border of the scapula.

This muscle is supplied by the long thoracic nerve, which was first described by Sir Charles Bell[1] in 1827 as the external respiratory nerve. The nerve arises by three roots from the fifth, sixth, and seventh cervical nerves. The root from the seventh nerve may be absent. The roots from the fifth and sixth nerves pierce the scalenus medius muscle, while that from the seventh passes in front of the muscle. The nerve descends behind the brachial plexus and the axillary vessels. It rests on the outer surface of the serratus anterior and as it courses along the side of the thorax to the lower border of the muscle, the nerve supplies filaments to each of its digitations.

The main function of the serratus anterior muscle is to aid in fixing the scapula to the thorax when the arm is elevated, particularly anteriorly, and also to rotate the scapula in abduction and during forward elevation.

Eshner[5] best describes the muscle function in relation to the shoulder. He states that many large and powerful muscles that control the motion of the shoulder and the upper extremity are attached to the scapula, causing elevation of the acromial process and outward rotation of the lower angle. The lower angle is rotated mediad by the rhomboids. The serratus anterior moves the scapula outward, forward, and slightly upward. It rotates the scapula on its inner angle and elevates the acromion, but this motion is opposed by the elevator muscle of the angle of the scapula and the rhomboids. It maintains approximation of the scapula to the thoracic wall. The actions of the different muscles are not simple, but are complicated so that a deficiency that might result from loss of function of any one or more might be in a large measure compensated for by others.

Etiology. The etiology is an unsettled question. Some say that the condition is a result of traumatic rupture of the serratus anterior muscle at its scapular insertion. The majority of physicians believe that injury to the long thoracic nerve which supplies the serratus anterior muscle is the prime etiological factor.

Berkheiser and Shapiro[3] discuss the etiology very logically. They believe that the differentiation is difficult to ascertain clinically, because of the inaccessibility of the motor points of the serratus anterior muscle. They state that on electrical stimulation of the long thoracic nerve of Bell, in the cases in which the deformity is due to nerve injury, there will be no

* From the Surgical Service, Station Hospital, Truax Field, Madison, Wisconsin. † The authors are Diplomates of the American Board of Surgery.

response. Likewise, if the muscle is completely torn, such stimulation to the nerve will not cause movement of the scapula. Thus they believe that due to the difficulty of stimulating the motor points of the serratus anterior muscle, one cannot elicit contractions of the muscle which can be interpreted by the motion of the scapula. Because of this, complete laceration of the muscle at its scapular insertion cannot be definitely ruled in or out. If the muscle is torn, they believe that there should be local tenderness, pain, swelling, and in some cases, superficial ecchymosis after a lapse of a few days, due to absorption of the hematoma. There is no description of such clinical findings in the literature. Berkheiser and Shapiro[3] also believe that if the muscle is torn, the patients would not improve with conservative management, as most of them do.

Numerous things have been enumerated that will cause damage to the long thoracic nerve. Various types of trauma are apparently the main cause. Overpeck and Ghormley[9] found trauma the etiological agent in 82 per cent, or twenty-three out of twenty-eight cases of winged scapula reported from the Mayo Clinic. However, the types of trauma are so inconstant that many theories have been advanced to explain the mechanism of the injury.

Overpeck and Ghormley[9] state that it has been shown that the coracoid process may be forced down against the underlying first or second rib and thus injure the intervening long thoracic nerve. This theory would explain the occurrence of winged scapula from falls on the shoulder girdle. It might also explain those cases that develop when the patients carry some object on the shoulder. Ilfeld and Holder[8] reported a case of traumatic paralysis of the serratus anterior muscle seen in their service at Camp Callan, California, which resulted from trauma incidental to carrying a full knapsack.

Hauser and Martin[7] presented two cases of winged scapulae from a Station Hospital in Virginia. In the one case the injury resulted from an attempt by the soldier to lift a garbage can to his left shoulder. He noticed an immediate burning sensation over the coracoid process, radiating to the tip of the scapula. The physicians believed that in this case the contraction of the scalenus medius muscle in fixing the chest wall during the act of lifting damaged the nerve. They suggested that a contracted scalenus medius muscle may have immobilized the nerve, causing it to be stretched as the shoulder completed its arch against resistance. However, the theory advanced by Overpeck and Ghormley[9] could be used to explain the mechanism of injury in this case and the second case which Hauser and Martin[7] presented. The second case was a result of an automobile accident in which a car was overturned and thrown under a Pullman car. The patient

FIG. 1. Case 1. Photograph showing winging of the scapula.

was pinned for two hours in the front seat of his car, in an inverted position, with his left arm jammed against the door and

Our first case apparently resulted from the patient lying in bed with his arms superabducted and his forearms flexed,

FIG. 2. Case 1. Position of patient in bed which was the probable mechanism of injury.

most of his weight resting on his left shoulder. Hauser and Martin[7] advanced a theory for this case. They thought that perhaps, the scalenus medius muscle, contracting to support the chest, pinched the nerve long enough to cause a palsy. We have discussed the cases presented by Ilfeld and Holder,[8] and Hauser and Martin[7] at length, because it is interesting to us that they have all occurred in the armed forces and within the past year.

We also wish to present two more cases which have occurred in the armed forces.

It was Brickner[4] who cited Sehrwald[11] as stating that paralysis of the long thoracic nerve occurs by bruising of the brachial plexus between the clavicle and the scalenus medius muscle in those cases in which the arm is superabducted. Potts,[10] in 1928, indicated that injury to the long thoracic nerve occurred in conjunction with patients sleeping on the abducted arm and rolling about during sleep, so that the nerve fibers to the inferior digitations of the serratus anterior muscle were stretched.

We believe that the mechanism of injury in our cases can best be explained by these theories and preferably by the latter ones.

to act as a pillow to support his head. He rested this way for two days, following the application of skin grafts to a pilonidal cyst wound, before he noticed his first symptoms. The second case developed four days after the excision of a pilonidal cyst. The patient found that he was most comfortable while resting on his abdomen. However, on the fourth day after operation, he spent the entire afternoon reading, with his head propped up by his right hand and with his right arm abducted. That evening he noticed his first symptom.

This condition has also been reported following wounds involving the supraspinatus region of the scapula. Various other causes of winged scapula have been mentioned, such as traction on the arms and hands during childbirth, direct injury to the nerve during operation on cervical glands, and injury sustained by a horse kicking the axilla, or a blow in this region while boxing. It has also developed after an individual misses a strong blow at a punching bag or after a golfer misses a golfball. Several authors have reported its development after an abdominal operation. The condition apparently was due to the position on the operating table.

Excluding trauma, the thoracic nerve of Bell may be involved in inflammatory or degenerative processes. It may develop following exposure to cold and wet. Febrile diseases, such as typhoid fever, influenza, diphtheria, and puerperal sepsis may be complicated by inflammation of the long thoracic nerve. The serratus anterior may be involved with other shoulder muscles in the muscular dystrophies as in anterior poliomyelitis. Hysterical paralysis has also been reported.

Symptoms. Pain was the first symptom noticed in both of our cases. It is also the one first noted in the majority of the cases reported.

The pain is usually most marked in the vicinity of the shoulder girdle. It is an agonizing ache and may radiate to the base of the neck and the back of the head, or downward over the arm and into the forearm and hand. A painful area in the axilla, especially over the midaxillary line and downward as far as the sixth or seventh rib, has been noted in some cases reported. This pain lasted two weeks in one of our cases, and three weeks in another.

The pain is usually severe enough that the inability to use the affected shoulder fully is blamed on voluntary splinting by the patient in the early stages. As the pain becomes more tolerable, the loss of motion in the shoulder becomes important to the patient. Physical examination will reveal an inability to elevate the arm above the horizontal. When this is attempted, the median border of the scapula approaches the vertebral spines. If the arms are held horizontally forward, the entire scapula protrudes like a wing on the affected side. The median border and the inferior angle of the scapula are removed from the thorax and a cavity results into which a hand can be inserted under the scapula. The arm can be elevated above the horizontal by the accessory muscles, if the upper portion of the body is inclined backward or, if the inferior angle of the scapula is rotated downward, outward, and held against the thorax. The patient is unable to apply pressure, such as that required in pushing.

Treatment. Therapy can be divided into conservative and surgical procedures. Conservative treatment consists primarily in some form of immobilization of the injured shoulder. Thomson and Miles[14] suggested the use of strychnine, muscle and nerve tonics, massage, and faradic stimulation. These men suggested a padded belt for pressure over the scapula to maintain the scapula against the thorax. Overpeck and Ghormley[9] noted good results after conservative physiotherapy and immobilization for some weeks. Follow-ups of fifteen of their patients treated conservatively indicated good results in eleven. Seven of the patients completely recovered, while four of them had persistent winging. Berkheiser and Shapiro[3] placed their patients in a plaster shoulder spica cast for approximately three months and followed this by physiotherapy. Their results in three cases were good. One patient had a

Fig. 3. Case 11. Photograph showing winging of the scapula.

good result even though eighteen months of disability preceded any treatment. Hauser and Martin,[7] Ilfeld and Holder[8] all used conservative therapy with satisfactory results. One of our patients has made very satisfactory progress with only a sling for immobilization combined with physiotherapy. The second patient has made some progress but a plaster shoulder spica cast will be necessary.

Various surgical procedures have been suggested as a means of therapy, but rarely has surgery been necessary. Skillern,[12] in 1913, reported a plan for substituting one of the three adjacent subscapular nerves for the proximal end of the long thoracic nerve, but no cases in which this has been done have been reported. Hass,[6] in 1931, reported a good result after fifteen years, occurring from transplantation of the teres major muscles to the digitations of the serratus anterior muscle. Overpeck and Ghormley[9] mention the two previously suggested procedures and add a third, which is fixation of scapula to the underlying ribs. Thomson and Miles[14] consider two methods of operative intervention: (1) the transplantation of the latissimus dorsi muscle over the inferior angle of the scapula, to diminish the deformity, and (2) transplantation of the clavicular origin of the pectoralis major muscle to the serratus magnus muscle or the axillary border of the scapula.

Fig. 4. Case 11. Position of patient in bed which was the probable mechanism of injury.

CASE REPORTS

Case 1. The patient, aged nineteen, was admitted to the Station Hospital on May 12, 1943, complaining of pain and swelling over the coccygeal area. These symptoms had occurred intermittently for three months. Two days prior to admission, the area became very painful so that hospitalization was necessary.

On May 14, 1943, a pilonidal cyst was excised. It was necessary to excise some necrotic tissue on May 24, 1943. In the following two weeks, the wound filled with granulation tissue. On June 8, 1943, skin grafts from the posterolateral aspect of the left thigh were applied to the granulating wound. Because of the grafts and the fact that it was more comfortable, the patient rested on his abdomen following this operation. He had not done this after the other surgical procedures. The patient lay in bed with his arms abducted and the forearms flexed so that his forehead rested on his hands. On June 10, 1943, or two days after the last operation, a pain was noted which extended from the right elbow up to the shoulder. This pain became progressively worse for several days and was relieved with salicylates. It then began to recede, but was present for two weeks. The pain seemed to end suddenly. The patient then noted that his right arm was weak. He was allowed out of bed on June 26, 1943, but it was

not until twelve days later that a definite diagnosis was made. An orthopedic consultation on July 9, 1943, showed paresis of the serratus anterior muscle with a winged scapula. His right arm and shoulder were immobilized with a sling and he was started on physiotherapy.

In the following two months, 25 per cent of the normal power returned to his arm. The winging of the scapula has persisted and a plaster shoulder spica cast will be used.

Case II. The patient, aged 26, was admitted to the Station Hospital on May 21, 1943, complaining of a draining wound in the region of the sacrum. In 1939, a draining pilonidal cyst had first been noticed. There was intermittent drainage until May, 1942, when the cyst was excised. The wound failed to close, so in November, 1942, he was re-operated upon and a primary closure was done but was unsuccessful. The wound continued to drain and, upon the soldier's arrival at his army post, the wound had become so uncomfortable that he was hospitalized.

The pilonidal cyst area was excised on May 24, 1943. The patient returned to the ward and found that he was more comfortable resting on his abdomen, which he did for the following four days. The fourth day following operation, he spent the afternoon reading with his head propped up by his right hand with the right arm abducted. That evening the patient noticed an ache in his shoulder. The following morning the ache was still present. It was described as extending from the lower part of his neck to the upper part of the arm and included the entire shoulder. It was relieved with salicylates. The only comfortable position for the boy seemed to be for him to rest on his abdomen, with his arm lying along his side.

The ache continued for approximately three weeks and then suddenly disappeared. During this time, he noted a gradual loss of strength in the right arm.

Treatment of the pilonidal wound continued and it was not until July 11, 1943, that attention was called to the winged scapula. Treatment was begun by placing the right arm in a sling and starting physiotherapy. He has made satisfactory improvement. The strength has practically all returned to his shoulder. Three months after the original symptom of pain the winging is 90 per cent less.

SUMMARY

1. Alar scapula can follow a minimal injury.

2. Winged scapula is more likely due to injury of the long thoracic nerve than to the serratus anterior muscle.

3. Conservative treatment using some form of immobilization in conjunction with physiotherapy gives good results in a great percentage of the cases.

4. Surgical procedures are seldom indicated.

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GASTRIC ULCER, BENIGN OR MALIGNANT*

A REVIEW OF RECENT LITERATURE

H. M. WILEY, M.D.
Resident in Surgery, Ellis Fischel State Cancer Hospital
COLUMBIA, MISSOURI

THE relationship of gastric ulcer to carcinoma has long been debatable. Histologically, it is difficult to trace the transformation of an ulcer into a carcinoma, and Mallory[1] has brought rather strong evidence to show that probably the opposite sequence of events takes place in most cases. The cancer itself ulcerates. This is particularly true in patients who have free hydrochloric acid, the acid apparently causing the center of the lesion to slough, leaving a so-called ulcerocancer. The frequency of malignant degeneration of ulcers varies from 1.9 per cent,[2] to 9.4 per cent,[3] or 71 per cent.[4] Ewing[5] aptly makes the following statement, "It is at least evident that quite specific criteria must be employed in the diagnosis of cancer following ulcer, since the conditions surrounding this process in the stomach are peculiar." Bloodgood[6] says, "Ulcer prevention and ulcer cure are part of cancer prevention and cancer cure." Walters[7] states, "In 10 per cent of the cases, gastric ulcer is malignant," and from our experience in clinically diagnosing these lesions, this seems to be correct.

In a report of superficial spreading gastric carcinoma, a type which tends to spread without invading the muscularis, Stout[8] found nine out of fifteen cases started at the margin of a peptic ulcer. These nine patients gave clinical histories of one to ten years' duration, which is suggestive of primary gastric or duodenal ulcers. Stout also reports an increasing number of ulcerated gastric carcinomas and carcinomas in peptic ulcers, all of which suggest the possibility that cases of gastric cancer are being seen earlier. In discussing the relationship of chronic ulcer to gastric carcinoma, Stout[9] says, "The only fact which emerges from this morass of uncertainties is the firmly established one that sometimes a cancer develops in the bed of a chronic ulcer which was non-cancerous at the start."

Gastritis has been studied extensively as a possible precancerous condition. Hurst[10] believes that the only common primary disease of the stomach is gastritis and that its prevention would at least partially if not wholly eliminate chronic gastric and duodenal ulcer and cancer of the stomach. Robertson[11] believes that deviation from the normal state within the gastric mucosa is a possible early beginning of gastric carcinoma. He concludes that, "The hyperplasia of the mucous glands may have some relation to the development of carcinoma." Judd[12] writes, "Carcinoma develops in a previously damaged stomach. Many years of such injury may be required before neoplastic transformation begins." Attempts at experimentally reproducing gastric carcinoma have been more successful where the environmental agents used simulate those conditions of the gastric mucosa most commonly found associated with human cancer, i.e., polyp, chronic gastritis, and ulcer.[13] Schindler[14] believes strongly that in many cases of cancer of the stomach, atrophic gastritis is a precursor, and adds that these patients should be carefully watched. Shapiro[15] is of the opinion that the frequent coexistence of atrophic gastritis and gastric carcinoma suggests an obvious relationship. Hebbel,[16] however, found the evidence of gastritis somewhat variable and could not conclude that in all cases gastritis preceded a malignant condition.

* From the Department of Surgery, The Ellis Fischel State Cancer Hospital, Columbia, Missouri.

Guiss[17] has found atrophic gastritis exceedingly common with advancing age. The slight difference in incidence of gastric atrophy between carcinoma and noncancerous stomachs, he believes, is not convincing. Konjetzny, as quoted by Hebbel,[16] emphasizes that the gastritis of ulcer is antrum-confined for the most part while that of cancer is a pangastritis.

We may conclude then that both gastric ulcer and carcinoma are nearly always associated with gastritis. It is impossible to tell in many cases which came first, but there is considerable evidence to show that gastritis frequently does precede gastric ulcer or carcinoma. From the clinical standpoint, the emphasis should be put on determining whether the gastric lesion is benign or malignant.

In many instances, it is difficult to establish the correct diagnosis by any of the present day methods.[18,19,20] There are, however, certain aspects of any case of gastric ulcer which should be thoroughly considered, and it is our purpose to enlarge on these.

Gastric symptoms should not be minimized. The initial symptoms of gastric carcinoma are slight and unreliable, and the textbook picture of a cachectic, anemic individual represents a late case. Scholz[21] stresses the fact that an unusually large percentage of patients with gastric cancer present symptoms similar to gastric ulcer and these symptoms may regress on an ulcer diet. Walters[22] in reviewing the clinical histories of 6,242 cases of cancer of the stomach at the Mayo Clinic, found that 31 per cent of the patients gave a history suggestive of ulcer. In our series, we found the following frequency of symptoms in chronic gastric ulcer and carcinoma of the stomach:

	Chronic Ulcer, Per Cent	Cancer, Per Cent
Pain in epigastrium	75	69.8
Vomiting	50	67.4
Epigastric distress	37	32.6
Weight loss	100	88.4
Melena	50	27.9

The duration of the symptoms was thirty-five months for patients with ulcer, and thirteen and nine-tenths months for those with gastric carcinoma.

Holman[18] states that the most pertinent physical finding is the presence of a palpable mass which they believe "almost always signifies malignancy." However, in the cases of a doubtful diagnosis, there is very rarely a palpable tumor. Fifty-eight per cent of our patients with gastric carcinomas had a palpable mass, but none was present in patients with gastric ulcers. This may indicate that we have been seeing our gastric carcinomas at a late stage. Other physical findings are usually of little help, except where there are obvious metastases, nodular liver, rectal shelf, Virchow's node, etc.

Allen[20] found that patients over fifty years of age, with gastric ulcers causing symptoms for less than a year, were five times as likely to have cancer as ulcer. Those with symptoms of over five years have the reverse ratio. Alvarez, in discussing Mont R. Reid's paper,[23] says, "We physicians will never get anywhere with our campaign for the early diagnosis or treatment of carcinoma of the stomach until we face the fact that a short history of indigestion in an older man is and always must be an alarming signal." The average age of our patients with gastric carcinoma was 64.1 years, and that for chronic ulcers 51.3 years. It should be stated here, however, that the patients admitted to this hospital are in the older age group and probably our figures for chronic gastric ulcer are higher than would be found in a general hospital. Of the patients seen here, 67 per cent are over fifty years of age. It should be remembered, however, that gastric carcinoma does not occur only in the older age group. Judd[39] found that approximately 7 per cent of those patients who have a gastric resection for malignant growths of the stomach are less than forty years of age.

The simplest and most common clinical test is the determination of occult blood in

the stools. Any ulceration in the gastrointestinal tract may cause bleeding, and while it is not specific, it may be relevant for arriving at the correct diagnosis. We found that 80 per cent of our gastric ulcers, and 73 per cent of our gastric carcinomas had either occult blood or frank melena in the stools. The absence of occult blood excludes cancer of the gastrointestinal tract except that of the infrequent scirrhous form.

A gastric analysis which shows no acid is suggestive, but one with acid is of no aid in the differential diagnosis between ulcer and cancer. Vanzant[24] in an investigation of a large series of patients without gastric disease, found an achlorhydria in from 25 to 35 per cent, between the ages of sixty and seventy years.

Our comparison of gastric acidity in cancer of the stomach and gastric ulcer is as follows:

	Ulcer, Per Cent	Cancer, Per Cent
Hyperacidity (over 50°)	37	11.4
Acidity within normal range	50	44.3
Acidity below 25°	12	44.3

Walters[22] has been able to demonstrate a definite relationship between the value of gastric acidity and resectability in cancer of the stomach. He writes, "As the value for gastric acids increases, the resectability rate increases" and further that, "The full explanation of this relationship is not readily apparent; however, in general the more extensive lesion is apt to be associated with low acids or achlorhydria, whereas, the smaller lesion is associated more frequently with higher values for free acid." Brunschwig[25] was unable to demonstrate any relation between the size of the lesion and the acid or achlorhydria present. He has shown experimentally that there is a secretory depressant present in extracts of achlorhydric cancerous stomachs.

The most important single diagnostic procedure in gastric lesions is *x*-ray study. Lesions which are apparently benign ulcers should be watched by repeated roentgenologic examinations, and all questionable lesions, especially in elderly patients, should be explored. Babe[26] in reviewing a group of gastric ulcers, says, "The most common error was for ulcer to be mistaken for cancer." He recommends that all apparently benign tumors be submitted to operation, for the recognition of their benign character is uncertain at best.

There has been a rather marked improvement in roentgen diagnosis of gastric lesions in the past two decades. Keutner, as quoted by Babe[26] submits the following figures: prior to 1918 he found that 23.3 per cent errors were made by roentgenologists, from 1918 to 1927 there were 17.3 per cent, and from 1928 to 1937 only 8.1 per cent. Roentgenologists, however, have emphasized that it is impossible to distinguish between benign and malignant gastric ulcer in all cases.[27,28]

During the past few years, gastroscopic examination has been developed. Schindler[29] in examining ninety-five cases of gastric tumors confined by surgery, found ninety-one gastric carcinomas and four benign lesions. Of the ninety-one cases of gastric cancer, five were wrongly interpreted and five were not seen. In his group of ninety-one carcinomas, there were fifteen failures at the first *x*-ray examination. He concluded that *x*-ray and gastroscopy will yield the best results in the diagnosis of gastric tumors when used together. He stresses that the gastroscope does not take the place of *x*-ray study.

Schindler[14] has also attempted to differentiate gastric cancer on its gross appearance and determine the prognosis. He has followed Borrmann's classification[10] finding 2.9 per cent polypoid carcinoma which carry a favorable outlook, 17.6 per cent ulcers surrounded by an elevated wall, 16.3 per cent ulcers walled off only on one side, these ulcerating lesions having a fair to poor prognosis,

and 63.2 per cent infiltrating growths, this last carrying a very poor prognosis. When those which resemble ulcer are added together (17.6 and 16.3, or 33.9 per cent), it corroborates the 31 per cent of gastric carcinoma having ulcer-like symptoms as reported by Walters.[22]

Most investigators, who have had experience with gastroscopy, believe that its use combined with *x*-ray study leads to more accurate and earlier diagnosis of gastric lesions. It should be remembered of gastroscopy that while it is an easy technic, interpretation is difficult and can be learned only by long study. Because of this, its usefulness is somewhat limited.

The most common site of gastric carcinoma in our series is in the prepyloric region. Review of our group of gastric carcinomas shows the locations as indicated below:

	Per Cent
Prepyloric acid	62.8
Fundus	11.7
Entire body of stomach	18.6
Cardia	6.9

The location of gastric ulceration is important, as stressed by Allen,[20] Kirklin,[31] and Holmes.[32] Allen[20] found the following approximate incidence of cancer in gastric ulcerations:

	Per Cent
Greater curvature	100
Prepyloric area	65
Anterior and posterior wall	20
Pyloric valve	10
Lesser curvature	10

Benign ulcer is found most commonly on the lesser curvature, and Ledoux-Lebard[33] showed that ulcer on the vertical part of the lesser curvature rarely becomes cancerous. Ulcers of the horizontal part of the lesser curvature (from the sulcus angularis to the pylorus), however, frequently undergo malignant degeneration. Kirklin[31] in reviewing 373 gastric lesions, found 112 (or 30 per cent) located in the prepyloric segment. Of these, ninety-three (or 83 per cent) proved to be malignant. Sampson[34] found that 75 per cent of chronic ulcers in the prepyloric inch of the stomach were malignant. It seems obvious, therefore, from these figures, that resection should be done on all lesions of the greater curvature and prepyloric area. Lesions on the lesser curvature should be watched carefully, and in the elderly age group (over fifty years) resection is the only safe course.

The size of the ulcer is only suggestive. Some believe that lesions over 2.5 cm. in diameter are malignant, but we have been impressed by the number of large gastric ulcers that we have seen, one measuring 7 by 4 cm., another 6 by 4 cm., and several over 2.5 cm. in size. Myhre[35] concludes that, contrary to the prevalent opinion, large niches may just as often represent benign lesions as cancer. It is sometimes difficult, even at the time of operation, to decide definitely as to their benign or malignant nature. The following cases bear out this point.

CASE REPORTS

Case 1. C. L., Hosp. No. 4443, a seventy-five year old white male, gave a history of intermittent post-prandial abdominal pain for approximately thirty years. Pain was frequently relieved by baking soda and milk. During the year prior to entry, the pain was almost constant, and there had been a weight loss of about fifty pounds. On at least three occasions, the patient had vomited blood and passed blood by rectum. Physical examination showed an anemic, emaciated white male, obviously chronically ill. He complained of tenderness in the epigastrium on palpation, but no mass was felt. Laboratory studies showed a hemoglobin of 3.9 Gm. (or 24 per cent), with 1,380,000 red blood count. White count and urinalysis were not remarkable. Non-protein nitrogen was 64 mg. per cent, total protein 5.9 Gm. per cent. Gastrointestinal series showed a large perforating ulcer of the prepyloric region with extensive cicatricial changes in the proximal duodenum. This lesion was interpreted as benign by the radiologist. There was a marked motor delay, 75 per cent residual in the twenty-four-hour films.

After preliminary gastric lavage and repeated blood transfusions, the patient was explored. At operation a firm mass was present in the prepyloric region attached to the pancreas.

It was thought to be a benign ulcer. There were no metastases seen. Accordingly, an antecolic end-to-side oralis totalis gastric resection with isoperistaltic jejunal alignment was carried out, the ulcer floor being left on the pancreas.

The specimen showed a well demarcated ulcer measuring 5.5 by 3 by 2 cm. in size. The mucosa extended down into the ulcer, the base having been cut away. Microscopic diagnosis: Adenocarcinoma (Dr. L. V. Ackerman, Pathologist).

On the fifth postoperative day, chest films showed a right middle lobe pneumonia with associated atelectasis. The patient was bronchoscoped and put on sulfadiazine, but failed to rally, and expired on the sixth postoperative day.

Case II. J. F., a fifty-four year old white male, complained of intermittent post-prandial pain for seven years which was relieved by taking baking soda and milk until three months prior to entry. There had been occasional emesis which was untinged by blood. The appetite had been poor and there had been a weight loss of forty pounds in approximately one year. No bloody or tarry stools were noted. Physical examination showed an asthenic white male who appeared chronically ill. There was tenderness in the epigastrium, but no masses were felt. Laboratory studies showed a hemoglobin of 7.7 Gm. (or 49 per cent), with 4,680,000 red blood count. The white count and urinalysis were negative. The non-protein nitrogen was 24 mg. per cent. The total proteins were 7.7 Gm. per cent. The stools repeatedly showed occult blood. Gastrointestinal series showed an enormous perforating gastric ulcer with atrophic gastritis and associated motor delay.

After adequate preoperative preparation, the patient was explored. A huge mass on the posterior surface of the stomach, with large lymph nodes along both borders, was seen. The mass was attached to the body and tail of the pancreas, and an operative diagnosis of perforating ulcer were made. A gastric resection was performed, peeling the ulcer off the pancreas, but leaving its floor attached. The ulcer measured 7 by 4 cm. and the microscopic diagnosis was chronic ulceration with hyperplasia of lymph nodes. The postoperative course was satisfactory.

Comment. In Case I the lesion seemed benign from the time of entry until the microscopic report was given. Even at operation, it appeared benign. Lesions, such as that found in Case I, cannot be cured without resecting a considerable part of the pancreas, and in view of the fact that more distant metastases occur concomitantly, this is hardly justified. A correct diagnosis in the first case could probably have been made by opening the stomach and removing a bit of the lesion for frozen section. Holman[18] encountered this same difficulty and reported that in twenty-three of 157 patients with gastric carcinoma, it was impossible to determine at operation whether the lesion was malignant or benign. Walters[7] also mentions this point. In Case II, the history is compatible with the findings, although throughout it was similar to Case I. It demonstrates that large ulcers are not necessarily malignant.

Patients with gastric lesions usually get relief from their symptoms after resection. Jordan,[36] however, noted that patients with duodenal ulcers rather frequently continued to have some degree of epigastric distress.

The rate of healing under medical care may, at times, be helpful in the diagnosis of questionable cases. We believe that if a gastric ulcer is not healed in approximately one month, as evidenced by *x*-ray examination, it should be resected. Clute[37] even goes so far as to say that, "When roentgenogram suggests cancer, immediate surgery is preferable to delay and repeated roentgen examination." Steigman[38] states, "When any ulcer responds poorly to medical treatment, it is presumptive evidence that it is malignant." It must be remembered, moreover, that malignant ulcers may temporarily regress under medical treatment. It has been found that 80 per cent of patients who have gastric resection for malignant tumors and who previously received medical treatment for presumed benign ulcer, experienced temporary relief from this form of therapy.[39]

The signs and symptoms of gastric ulcer and carcinoma are similar, and only

by competent roentgenologic study can early lesions be differentiated, and then not with certainty in approximately 10 per cent of the cases. It is estimated by the United States Bureau of the Census (1939) that 37,000 people die annually of cancer of the stomach. At the present time, the only hope for cure in gastric carcinoma lies in establishing the diagnosis at a time when surgical removal of the growth is possible, as metastases occur early and are frequent. Coller[40] by means of a modified Spalteholz cleaning method, demonstrated node metastases in 75 per cent of fifty-three cases, and believes that with complete examination, the incidence of involvement might have been 88 per cent. The prognostic significance of lymph node metastases is demonstrated by the following figures: cases without regional lymph node involvement had a five-year survival rate of 43.1 per cent, as compared with only 16.5 per cent in cases in which there was involvement.[41]

Every case that does not have signs of distant metastases should be explored. It must be remembered that radiologists cannot always tell if a case is operable, but as Stout[15] has said, "It is wiser to resect chronic ulcers of the stomach rather than to treat them more conservatively, because one cannot be sure that a lesion which seems clinically to be an ulcer may not in fact be a cancer." In our group of forty-three cases of cancer of the stomach seen here since the hospital opened in May, 1940, we have explored 81.4 per cent, and resected 27.9 per cent. This again is in accordance with Walters[22] who resected 25.5 per cent at the Mayo Clinic. It is too early for us to draw any conclusions on the survival rate. We have tabulated those items which we believe are of aid in differentiating gastric ulcer from ulcerocancer of the stomach.

CONCLUSIONS

In reviewing our cases and the recent literature on gastric ulcer and gastric carcinoma, we have come to the following conclusions:

1. Gastric ulcer or cancer cannot be differentiated even with special studies in about 10 per cent of all cases. At operation it may also be impossible to define the exact nature of the gastric lesion.

2. All patients over fifty years of age with a proved gastric lesion and with symptoms of less than one year's duration should be operated upon. In younger individuals, gastric ulcers which do not show satisfactory regression in approximately one month on medical treatment, should be resected. If healing does occur, repeated observation should be made at short intervals.

3. All patients with ulcers in the pyrepyloric region or on the greater curvature should be resected, because a high percentage of lesions in this location become malignant (100 per cent for lesions on the greater curvature, and 83 per cent for those in the pyrepyloric region.)

4. While large ulcers do not necessarily mean malignancy, they should be resected on that probability. Gastric cancers which simulate gastric ulcer carry a better prognosis and this alone makes surgery the treatment of choice. Also, but of lesser importance, the patient with a large gastric ulcer is likely to be very uncomfortable until it is removed.

5. Ulcerating gastric lesions in the absence of free hydrochloric acid should be immediately operated.

6. Gastric ulcers are surgical problems from the onset, and should be seen by a surgeon when first diagnosed. They should not be confused with duodenal ulcers which may frequently be adequately treated medically, and in which there is not the danger of malignant degeneration. An increasing group of investigators favor resection on all ulcerating gastric lesions.[7, 9, 16, 18, 39]

7. Operability cannot be decided by the roentgenologist.

8. The only way that we can hope to help these patients is to increase our resectability rate by earlier diagnosis, and this in turn depends upon us, as physicians, taking heed of all gastric complaints.

AIDS IN DIFFERENTIATING GASTRIC ULCER FROM ULCEROCANCER OF THE STOMACH

1. Symptoms	Essentially the same duration may be longer	Shorter duration, but of no value
2. Physical examination	No palpable mass	May be palpable mass
3. Age	Onset usually under 50 years of age	More common over 50 years but 7% of gastric resection for malignant growth are in pts. under 40
4. Special procedures		
a. Occult blood in stool	No value 80% positive	No value 73% positive
b. Gastric analysis	Acid commonly present and frequently high	Anacidity is only suggestive
c. Roentgen diagnosis	Approximately 10 per cent of ulcerating gastric lesion can not be differentiated as to benign or malignant nature	
d. Gastroscopy	Approximately 10 per cent of gastric lesions not seen or wrongly interpreted, even in experienced hands	
5. Location of ulcerating lesion		
a. Prepyloric	25 per cent	75 per cent (Sampson 34)
	35 per cent	65 per cent (Allen 20)
	17 per cent	83 per cent (Kirklin 30)
b. Greater curvature	0 per cent	100 per cent (Allen 20)
6. Size of ulcer	Large ulcer is only suggestive of malignancy	
7. Rate of regression under medical care	Of no value, may be misleading	

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The *encapsulated subcutaneous lipoma* found on the trunk, or the trunk end of a limb, is recognized with ease by its doughy solidity and by the dimpling of the overlying skin when this is made tense by manipulation.

Case Reports

UNRUPTURED INTERSTITIAL PREGNANCY

JOHN J. KEENAN, M.D.
Gynecologist, Troy Hospital
TROY, NEW YORK

INTERSTITIAL pregnancy is an uncommon condition. It is rarely encountered prior to rupture. Before 1893 the only available reports are those of postmortem records. In that year Traub, and eight days later, Tait each operated for this condition. Of the cases reported in the next forty years Ash states that some 200 would withstand critical analysis, an average of five per year.

Ectopic pregnancy occurs once in three hundred pregnancies (Schumann). It comprises 1.3 per cent of all gynecologic admissions to the hospital (Wynne). Series of collected cases indicate that the interstitial variety is responsible for less than 2 per cent of all ectopic pregnancies. Approximately one in five interstitial pregnancies is unruptured at the time of operation. The greatest incidence occurs in the age period from twenty-five to thirty-five. In 1937, D'Errico had collected twenty-three cases, including one of his own, of interstitial pregnancy occurring in the stump subsequent to the removal of the extra-uterine portion of the tube.

PATHOLOGY

Interstitial pregnancy is found in that part of the Fallopian tube which lies within the uterine wall. This is the narrowest and shortest portion. Etiological factors involved are those of any ectopic pregnancy: pelvic inflammatory diseases, congenital abnormalities, operative trauma, tumors, etc. The traditional classification, theoretically attractive, divides the condition into three groups based on the site of implantation: utero-interstitial, true interstitial and tubo-interstitial. On the basis of adequately studied cases Glaesmer's grouping appears more practical: occurring in the fundus of the uterus, in the side wall and, thirdly, near the isthmus.

As the gestation progresses, imbedded as it is in the uterine wall, it is more strongly protected than when located in the thinner extra-uterine portion of the tube. As a result, rupture of the interstitial variety occurs on the average of four weeks later than in the more laterally placed types. Cases have been reported as continuing until the eighth month. Rupture is followed by severe hemorrhage and the mortality is high, being estimated at 12 per cent which is four times greater than for ectopic pregnancies in general. The prognosis depends directly upon whether operation occurs before rupture for nearly every patient operated upon before rupture has survived.

DIAGNOSIS

The diagnosis is very difficult to make before rupture and is practically impossible afterward due to the emergency nature of the case, the rigidity of the abdominal muscles and the intense pelvic tenderness. Before rupture the symptoms of ectopic pregnancy should make one suspicious: a missed or delayed period, the presence of abnormal uterine bleeding and the complaint of pelvic discomfort. The single suggestive pelvic finding is the palpation of a mass attached by a broad base to one cornua of the uterus. It may readily be confused with a normal intra-uterine pregnancy accompanied by a cornual myoma,

a tubal pregnancy, a pregnancy in one horn of a bicornuate uterus or a pregnancy in a rudimentary horn.

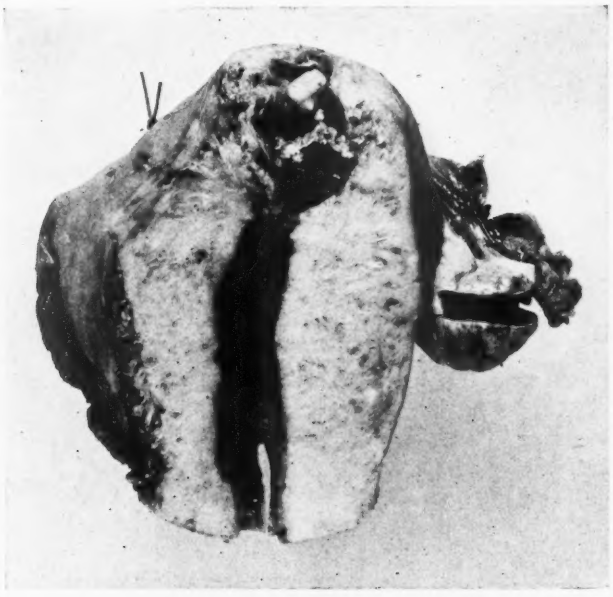

Fig. 1. View of bisected uterus with right tube and ovary attached. The gestation sac enclosing the embryo is seen in the right cornua of the uterus.

TREATMENT

The treatment varies depending upon the general condition of the patient, the size and state of the gestation, the amount and degree of coincidental pelvic disease and the wishes of the patient. Abdominal exploration is necessary. If there is evidence of rupture, the usual measures for combating acute blood loss and its accompanying shock must be undertaken. Supracervical hysterectomy is indicated in most instances. If operation occurs before rupture and particularly in the earlier weeks, excision of the sac, its contents and the surrounding muscle may be safe. However, unless one is extremely anxious to save the uterus, as in the case of a sterile couple, hysterectomy here is also the treatment of choice. It can be done safer and faster than cornual excision.

CASE REPORT

M. P., para iv, gravida vi, age thirty-eight, was first seen on October 5, 1943, complaining of abnormal uterine bleeding. Her expected July period was one week late and began on July 15th. She flowed until July 26th. On August 6th, she began to flow again and continued until August 15th. Starting August 23rd, she bled daily until October 5th. Her menses began at the age of twelve, occurred every twenty-eight days with a three day flow. There was no dysmenorrhea or leukorrhea. Urgency had recently developed. Her past history was otherwise non-contributory.

Physical examination was essentially negative except for a relaxed pelvic outlet and an unusual, soft, definitely palpable enlargement of the right horn of the uterus, palpation of which produced a distinctly uncomfortable sensation on bimanual examination. Ectopic pregnancy was diagnosed but the unusual pelvic findings created a doubt. The alternative diagnosis was a myoma involving the right horn of the uterus. Immediate surgery was urgently advised but due to an upper respiratory infection the patient insisted on deferring surgery until October 9th.

At operation, preliminary uterine currettage and examination was followed by abdominal exploration. Pathological findings were limited to the pelvis. There was no intraperitoneal bleeding. Both tubes and right ovary appeared grossly normal. The left ovary contained a hemorrhagic corpus luteum. The uterus was assymetrically enlarged to the right. Here was

a cyst-like enlargement in direct continuity with the right horn, presenting on the antero-superior aspect of the uterus. The extra-uterine portion of the tube entered the uterus inferior to this enlargement. A diagnosis of unruptured interstitial pregnancy was made and a right salpingo-oophorectomy and supracervical hysterectomy was accomplished.

FIG. 2. Close-up view of the right cornua of the uterus.

The postoperative course was uneventful except for an exacerbation of the upper respiratory infection which was readily controlled. The patient was discharged from the hospital on October 23rd. The incision was completely healed.

The specimen consisted of uterus, right tube and ovary and tissue from the uterine currettage. The gross specimen consisted of a uterus, including the corpus and upper portion of the cervix with the right tube and ovary attached. It measured 9 by 6 by 5 cm. and weighed 128 Gm.

The fundus exhibited an irregular ovoid swelling in the right anterior superior portion. Cross section revealed this to be due to a cavity in the myometrium extending from the endometrium toward the exit of the right tube occupying the site of the uterine portion of this tube. The cavity measured 2.5 cm. in its greatest diameter. It was lined by a smooth membrane beneath which was a layer of spongy, hemorrhagic tissue. It was separated from the serosa by a thin layer of myometrium, 0.3 to 0.5 cm. in thickness. In its inferior portion the cavity extended closely to the endometrium.

The cavity contained a small embryo, which measured 1.2 cm. along its convex border and weighed 140 mg. The eye was becoming prominent and the limb buds were beginning to appear. Its estimated period of development was four to five weeks.

The lining of the uterine canal was rough and hemorrhagic as a result of previous currettage. The cervical mucosa was slightly roughened and congested. The uterine wall averaged 2.4 cm. in thickness.

The attached tube and ovary were not grossly remarkable.

A small amount of uterine currettings accompanied the above specimen. They were segments of soft, brownish-grey membranous tissue.

Microscopically, sections through the wall of the cavity in the myometrium showed a lining of placental tissue composed of chorionic villi covered by Langhans' cells and a thin layer of synctium. The villi were embedded in decidual cells and extended into the smooth muscle. In one place the placental tissue closely approached endometrium.

Sections through the lining of the uterine canal showed a thin layer of endometrium, the glands were ovoid or elongated and lined by simple columnar epithelium whose cytoplasm was pale, eosinophilic and free from vacuoles. The endometrial stroma was moderately congested but compact. Decidual reaction was not observed here.

Sections of the tube, ovary and cervix were not remarkable. The uterine currettings ex-

hibited a structure similar to that noted in the remaining endometrium of the corpus.

Diagnosis: Ectopic pregnancy, interstitial portion of right tube, unruptured. Period of gestation four to five weeks.

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A UNILATERAL episiotomy should not be performed as a routine procedure in normal labour but is indicated in a few cases when there appears to be some atresia of the vaginal outlet, and in certain cases of forceps delivery, e.g. in a case of occipito-posterior position when manual rotation has been performed.

DERMOID CYSTS OF THE MESENTERY

CASE REPORT

MAJOR CHARLES F. JAMES, JR.
MEDICAL CORPS, ARMY OF THE UNITED STATES

BENEVIENE,[1] a Florentine anatomist, in 1507 reported a mesenteric cyst that he found at autopsy. From Beneviene to 1850 all reports were made from autopsy material. Larkin,[2] in a review of the literature, found that from 1850 to 1880 mesenteric cysts were found at laparotomies but no recoveries noted; from 1880 to 1900 operative procedures on such cysts were successful, and from 1900 on, the condition has been definitely known, successfully treated, and occasionally diagnosed preoperatively.

Incidence. Dermoid cysts of the mesentery are the rarest of all mesenteric tumors. Cornies,[3] in a review of the literature through 1920, found that eight proved cases of mesenteric dermoids had been reported. Seven cases have been reported since 1920, one each by Sommer,[4] Piermarini,[5] Cortella,[6] Montgomery and Marest,[7] Penberthy and Brownson,[8] and two cases by Judd and Fulcher.[9]

The writer is reporting the sixteenth case which differs slightly from previous reports in that two dermoids of the mesentery were found in one patient.

Origin and Location. The theory is quite adequate to explain dermoids arising near the sites of union of the different germinal layers during development such as the orbital region, neck and coccygeal region; it does not seem adequate to explain those arising in the mesentery. The development of the mesentery is formed by the association of the splanchnic mesoderm with the infolding of the intraderm. As development proceeds the dorsal mesentery persists as seen in the adult and the ventral mesentery is occupied by the liver and heart, therefore, it is difficult to imagine cysts forming from developmental errors in the mesentery.

Dowd[10] is of the opinion that such cells might have been derived from the Wolffian body or the Mullerian tube. Ewing[11] believes that the majority of complex dermoids are imperfectly developed teratomas and favors the theory of origin from sex cells.

Guthrie[12] has described true diverticula which seem to come from the intestine. These diverticula protrude into the mesentery and become pinched off either to be absorbed or persist and form cysts.

Dermoids are located in any portion of the mesentery, from celiac axis to pelvis but are most commonly found in relation to the lower end of the ileum.

CASE REPORT

A twenty-four year old American soldier entered the hospital complaining of pains in the lower abdomen, nausea and loss of appetite. These complaints had been present for two weeks but not severe enough to consult a doctor until two days before admission when he felt as if he had a fever and the abdominal cramps were worse. There was never any vomiting, constipation, diarrhea, or urinary disturbances, and no history of similar illness. The patient had lost six pounds in weight since his illness because of poor appetite.

Physical examination showed a well developed and well nourished male in some apparent abdominal discomfort. His temperature was 100.5°F, the pulse 100 and the respirations 20. The blood pressure was 110 systolic, 70 diastolic. Positive findings were limited to the abdomen and rectal palpation.

In the abdomen there was a tender, fixed mass which appeared to fill the right lower quadrant and extended over just to the left of the umbilicus. A mass high on the right was felt outside the rectum. The patient's condition did not appear to be one that needed immediate surgical intervention, but careful observance of the apparent walled off localized appendiceal

abscess. The author being a believer of the school that does not recommend immediate surgery of a well walled off appendiceal abscess as long as the patient's condition is satisfactory (which is judged by the general appearance, temperature, pulse, respiration, blood count and other abdominal findings), the patient was put on chemotherapy and oral diet was restricted.

Fig. 1. Barium enema showing location of masses in relation to cecum.

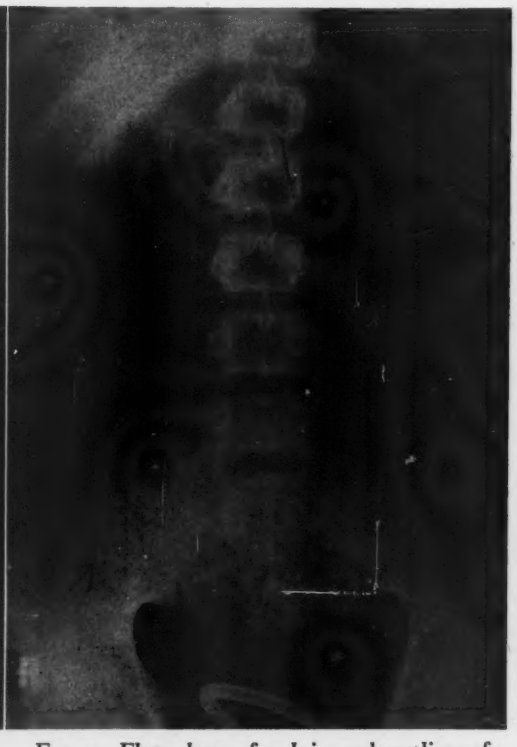

Fig. 2. Flat plate of pelvis and outline of masses just before injection of dye for cystogram Figure 3.

Examination of the blood on admission revealed a red cell count of 4,840,000, a hemoglobin of 95 per cent, and a white cell count 20,000, with 86 per cent polymorphonuclears. The urinalysis was negative. Six hours after admission his condition was satisfactory; the temperature 99.5°F., pulse 90, respirations 20, a white cell count of 12,500 with 79 per cent polymorphonuclears. Forty-eight hours after admission the temperature, pulse, and respirations were normal. The white cell count had dropped to 9,900 with 71 per cent polymorphonuclears. The patient appeared to be improving and chemotherapy and intravenous feedings were continued. Six days following admission in examining the abdomen the mass appeared changed in position and was ballotable. A flat plate of the abdomen showed a large, sharply outlined, rounded, oblong mass, containing numerous small areas of calcification. A lateral film of the abdomen was taken for localization and exclusion of bony attachment. The patient's temperature had been normal for ten days and with these films and progress of patient the mass did not appear to be appendiceal in origin. The patient was up and about in the surgical wards and apparently getting along nicely except the anorexia and abdominal masses persisted. Further *x*-ray studies were made as shown in Figures 1, 2, and 3.

From the *x*-ray studies a preoperative impression of dermoid cyst was made and the patient prepared for operation.

Under gas, oxygen, and ether anesthesia the abdomen was opened through a right midparamedian incision. Exploration of the peritoneal cavity revealed two fixed oblong cystic (solid) masses, one measuring 2 by 4 inches and the other 2 by 3 inches, situated in the mesentery of the distal two feet of the ileum. They were approximately three inches apart. The smaller mass contained adherent omentum and showed signs of recent perforation with spilling of contents. The small mass was enucleated with moderate difficulty. Care was

taken to avoid major blood vessels and the blood supply to the intestines did not appear impaired. The mesentery was then closed with continuous atraumatic chromic catgut No. 00 following ligation of all small bleeding vessels. The same procedure was carried out for the larger mass with more difficulty and in the process a small perforation was made during sharp dissection but was promptly closed with a purse-string suture. Five Gm. of sulfanilamide powder was placed intraperitoneally and the abdomen closed without drainage.

FIG. 3. Cystogram showing elevation and movability of masses to a higher level as compared with flat plate of pelvis in Figure 2.

The pathological report revealed:

"Gross: Two tumor masses, both similar. One kidney-shaped and lobulated measuring 9.5 by 5.8 by 4.5 cm. and having a fibrous capsule with many small vessels and ecchymotic spots giving it a slightly mosaic appearance. On section the capsule measures 0.3 cm. in thickness and the entire mass is filled with a light clay-colored, yellow-gray caseous material more like a paste. On removing the caseous material the inner surface presents slightly elevated ridges and points some of which are calcified and being as large as 1 to 2 cm. The other tumor mass measures 8.5 by 5.4 by 4.8 cm. and has attached a fibro-fatty tissue (apparently omentum) which measures 12.0 cm. in diameter. This tumor is smooth surfaced and egg-shaped and likewise presents the same features as the other.

FIG. 4. Gross specimens intact following enucleation from mesentery.

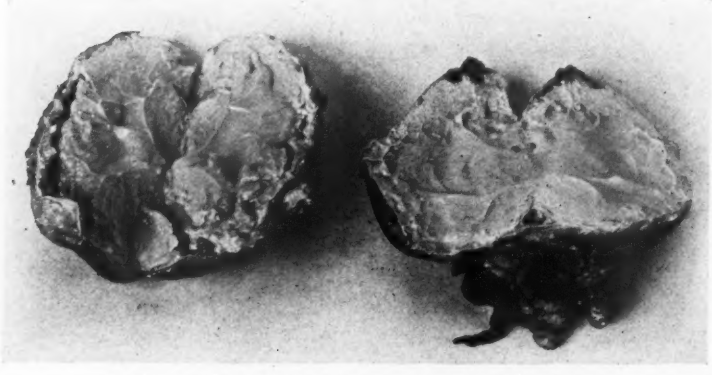

FIG. 5. Sagittal sections of gross specimens.

"Microscopic: Sections confirm gross diagnosis; the wall is lined by a flattened epithelium which is supported by a fibrous laminated

stroma. Within portions of this stroma are rather large amounts of bony structure characterized by definite lacunae, trabeculae and Haversian System.

"Note: At one point of a papillary like projection appears to be the excretory source. No hair found in any portion.

"Diagnosis: Dermoid cysts of the mesentery."

Following operation the patient made an uneventful recovery, the temperature never ranging above 99.8°F. Intravenous fluids were given in the first twenty-four hours postoperatively and sulfadiazine orally for seventy-two hours.

The symptoms of dermoid cysts of the mesentery are those of complications such as obstruction (kinks, volvulus, intussusception) peritonitis, hemorrhage, (sloughing of blood vessel) and torsion. In the case presented, a localized peritonitis was the reason for admission and the movability of the mass later (six days after admission) suggested a thorough investigation as the picture was not that of appendiceal abscess which was the initial impression. A preoperative impression of mesenteric cysts was obtained by the process of elimination and the radio-opaque material in the cysts suggested the cysts being dermoids. Some may wonder why a cystogram was indicated after taking anteroposterior and lateral views of the abdomen, gastrointestinal series and barium enema.

The roentgenologist encountered a very unusual experience while palpating the abdomen during the barium enema in that the patient had a very copious ejaculation without an erection, and the fluid was greater in amount than normal. This experience warranted a cystogram to exclude a possible encysted diverticula of the bladder. Views of the gross specimens are shown in Figures 4 and 5.

SUMMARY AND CONCLUSION

1. Dermoid cysts of the mesentery are rare, the case presented being the sixteenth to be reported in the literature.

2. Expectant treatment of a localized, walled off peritonitis and later *x*-ray studies enabled a preoperative impression of dermoid cysts of the mesentery.

3. The cysts were located in the distal two feet of the ileum.

4. The origin of dermoid cysts of the mesentery remains undetermined.

5. Symptoms exhibited in this case were those of complication (peritonitis).

6. Treatment rendered was enucleation of cysts without intestinal resection.

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GANGLION CELL TUMORS OF THE NECK*

TWO CASE REPORTS

MILTON D. BOSSE, M.D.,
Assistant Pathologist, Western Pennsylvania Hospital
PITTSBURGH, PENNSYLVANIA

MAJOR JOSEPH A. SOFFEL,
MEDICAL RESERVE CORPS, ARMY OF THE UNITED STATES

LIEUT. COMDR. W. SCOTT NETTROUR
MEDICAL CORPS, UNITED STATES NAVAL RESERVE

AND LIEUT. J. Z. ROHM
MEDICAL CORPS, UNITED STATES NAVAL RESERVE

THE infrequency of ganglion cell tumors in general and of those occurring in the neck in particular is indicated by the reviews of McFarland and Sappington[1] and of Shumacker and Lawrence.[2] The former listed seventeen reported cases of cervical ganglioneuromas and added one of their own. However, the latter tabulated only fourteen cases including one of their own. They excluded several cases listed by McFarland and Sappington[1] because the tumors apparently arose in the mediastinum or appeared to be a neuroblastoma, sympathicoblastoma, or of a mixed type. The rarity of cervical ganglion cell tumors prompts the presentation of the following two cases:

CASE REPORTS

CASE I. A white girl, five and one-half years old, was admitted to the hospital because of a firm, movable tumor below the angle of the left jaw. It was first noticed about eight months previously and gradually enlarged to a diameter of approximately 4 cm. The tumor was excised without difficulty from beneath the left sternocleidomastoid muscle. The postoperative course was uneventful except for some impairment of motion of the left eyelid, of about six months' duration. Other features of Horner's syndrome were absent. She has remained well and without evidence of recurrence or metastasis during a three-year period of observation.

The gross specimen was an encapsulated, moderately firm, rubbery mass measuring 2.5 by 3.5 by 4 cm. The tissue cut with moderate ease, revealing a slightly bulging, pink-yellow, somewhat whorled surface.

Microscopic examination of hematoxylin and eosin preparations revealed that the bulk of the tumor was composed of a rather compact, fibrillar tissue, arranged in irregular and intersecting bundles, which had the appearance of nerve tissue. Ganglion cells were scattered here and there through this tissue singly or in small clumps. Near the center of the tumor there were several areas of somewhat loose fibrillar tissue in which considerable numbers of ganglion cells as well as other smaller cells were enmeshed. (Fig. 1.) The ganglion cells were large and irregular, with fairly homogeneous, pink cytoplasm and eccentrically placed, large, round or oval nuclei containing a prominent chromatin network and nucleolus. A number of other cells were about the size of lymphocytes, and had very scant, pink cytoplasm with rounder, dark nuclei. Cells of all intermediate stages were also present. Mitotic figures were not found, but an occasional ganglion cell had two nuclei. Some of the larger cells had vacuolated cytoplasm and no nuclei.

Masson's trichrome stain showed small to moderate amounts of connective tissue in the compact areas, but none in the loosely arranged tissue containing more numerous ganglion cells. Bodian's protargol stain[3] demonstrated that most of the fibers in the compact areas and all of them in the loosely arranged tissue were nerve fibers.

The diagnosis was ganglioneuroma.

CASE II. A white man, eighty-eight years old, noticed a tumor of the right side of his neck for about one year. It had enlarged

* From the Institute of Pathology, Western Pennsylvania Hospital, Dr. Ralph R. Mellon, Director, and the Division of Surgery.

gradually during this period until it was about 3 by 4 by 5 cm. At that time a roentgenogram of the chest revealed a number of large and small round areas of increased density in both lungs, typical of metastases. A biopsy of the neck tumor was taken. Roentgen therapy was given, but the patient died at home one month later. An autopsy was not performed.

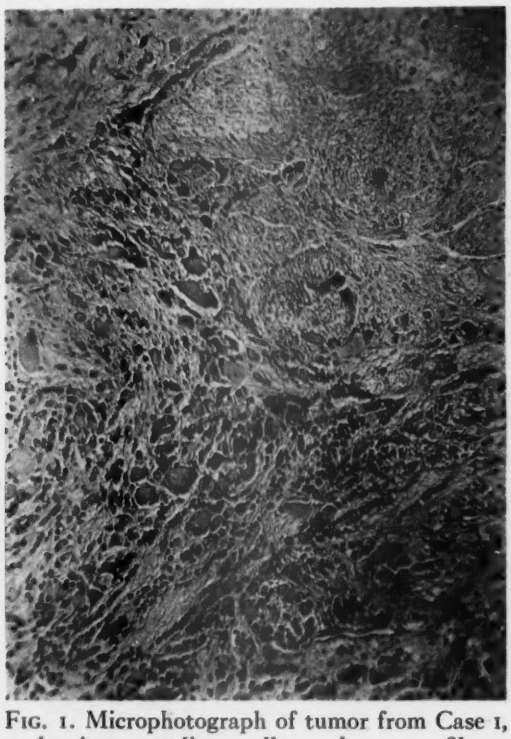

FIG. 1. Microphotograph of tumor from Case 1, showing ganglion cells and nerve fibers; hematoxylin and eosin; × 80.

The tissue from the biopsy consisted of a very soft, pink, structureless mass about 0.5 cm. in diameter. Microscopic examination of hematoxylin and eosin preparations revealed a highly cellular tissue. The cells were irregularly disposed in a loose fibrillar matrix and were not interconnected. They were quite variable in size and shape, and many appeared to have interlacing processes. (Fig. 2.) The cytoplasm of the large cells was usually pink, although it was frequently vacuolated and sometimes smudged or frayed at the edges. The nuclei of these cells were usually large and oval or somewhat irregular. Some of them were very hyperchromatic; others were vacuolated; and occasionally they had distinct chromatin network and a prominent nucleolus. There were also many small cells with scant cytoplasm and round or somewhat irregular dark nuclei. Many of the cells represented transitions between the large and the small cells. Occasional cells were noted with two nuclei and some had no nucleus. Mitotic figures were infrequent. A few small blood vessels were scattered here and there through the tissue.

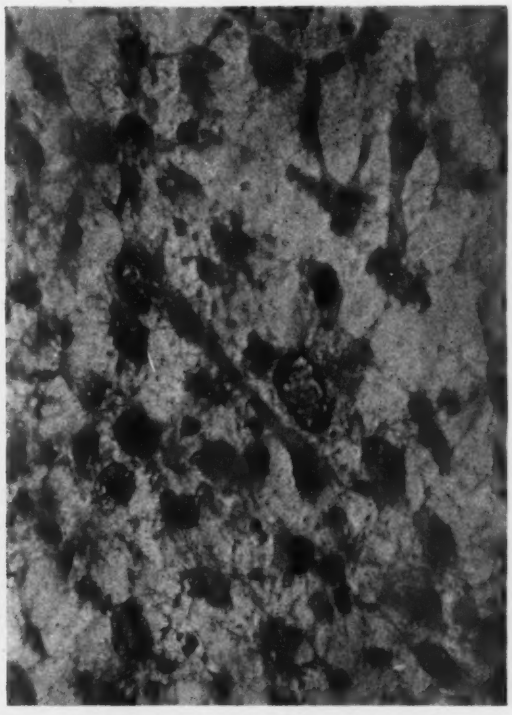

FIG. 2. Microphotograph of tumor from Case II, showing marked variability in size and shape of the cells. Note the processes of some of them; hematoxylin and eosin; × 660.

Van Gieson's stain and Masson's trichrome stain showed no collagen between the cells and there was only a scant amount of connective tissue, which was located around the scattered small blood vessels. Mallory's phosphotungstic acid hematoxylin stain revealed no neuroglial fibrils. Bodian's protargol stain[3] demonstrated that the fibrils of the matrix were neurofibrils.

The diagnosis was ganglioneuroblastoma.

COMMENT

The most generally accepted theory for the origin of ganglion cell tumors is that they arise by multiplication of embryonal neurocytes which continue to multiply and differentiate through the various stages up to adult ganglion cells. Thus tumors of this type may often be composed of varying proportions of cells representing the different stages of embryonal development. Similar to neoplasms of other tissues, it

appears that the more highly differentiated the ganglion cell tumors are the more likely they are to be benign. The terminology used in diagnosing these tumors is not well defined, however. Shumacker and Lawrence[2] considered that the term, ganglioneuroma, should be applied exclusively to tumors showing ganglion cells and nerve fibers without sympathicoblasts or neuroblasts. On the other hand, a number of cases that have been reported as ganglioneuroma apparently contained many poorly differentiated cells, as well as mature ganglion cells. In fact, McFarland and Sappington[1] refer to a report by Gibberd describing as ganglioneuromas two tumors in which no ganglion cells were found. Even Shumacker and Lawrence[2] mentioned in the description of their own case that a few small aggregations of small round cells with a very thin rim of pale eosinophilic cytoplasm and round, deeply staining basophilic nuclei were scattered diffusely throughout the sections. These cells surely would not be considered mature ganglion cells. Thus, while it may be advisable to reserve the term ganglioneuroma for tumors composed principally of mature ganglion cells and nerve fibers, it seems unnecessary to insist that all of the ganglion cells be mature.

The tumor from the first patient in this report had the typical appearance of a benign ganglioneuroma similar to the cases included by Shumacker and Lawrence.[2] While it contained some apparently immature cells, it has followed a benign clinical course. The biopsy from the second patient, however, showed predominantly poorly differentiated cells as well as a number of cells more nearly approaching the appearance of adult ganglion cells. While the tissue examined was somewhat degenerated and other portions of the tumor and its metastases were not obtained, the term ganglioneuroblastoma describes its partially differentiated microscopic structure and indicates its malignant nature.

SUMMARY

Two cases of ganglion cell tumors of the neck are reported. One patient was a white girl, five and one-half years old, with a well differentiated tumor, a ganglioneuroma. She has remained well for three years since its removal. The other patient was a white man, eighty-eight years old, with a partially differentiated tumor, a ganglioneuroblastoma. This tumor was associated with roentgenologic evidence of pulmonary metastases and a malignant clinical course.

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CONGENITAL ATRESIA OF THE ILEUM, SPONTANEOUS PERFORATION AND MULTIPLE INTUSSUSCEPTION*

TWO CASE REPORTS

BERNARD J. FICARRA, M.D.
Resident Surgeon, Kings County Hospital

AND

WILLIAM B. DEGEN, M.D.
Resident Surgeon, Kings County Hospital

BROOKLYN, NEW YORK

ABDOMINAL surgery of infancy and childhood has received accentuated attention from the general surgeon in recent years. Some surgeons have stressed this branch of surgery as a distinct specialty. It cannot be denied that extreme delicacy is necessary in pediatric surgery, even as the cases encountered present most interesting features. In the course of our residency in pediatric surgery, we have seen two unusual cases which we are presenting herewith.

CASE REPORTS

CASE 1. The patient was a premature infant (eight months) born to a primiparous mother. The mother had hypertension and polyhydramnios. At the time of birth the child cried loudly and breathed spontaneously. The birth weight was 4 pounds, 4 ounces. The general appearance of the baby apparently was satisfactory. On the first postpartum day marked abdominal distention occurred. A Levine tube attached to a Wangensteen suction apparatus plus a rectal tube failed to relieve the distention. At this time the temperature was 102°F. and the infant regurgitated yellow green fluid. During the twenty-four hours following birth no stool was passed. Enemas gave no results. An emergency flat plate of the abdomen was taken at this time. (Fig. 1.)

Surgical consultation was requested. The infant was subjected to surgery thirty-six hours following birth. The abdominal cavity was entered via a right paramedian incision. When the peritoneal cavity was entered many organized adhesions were found between the parietal and visceral layers. The entire small intestine was found to be matted together by an organized fibrinous plastic exudate. The ileum was bound down forming the mass visualized by *x*-ray. This mass measured 3½ by 2½ inches and was found in the right mid-abdomen. At this point the ileum was perforated for its entire diameter. Meconium fluid seeped through this opening. The intestinal perforation occurred five inches from the ileocecal valve. Three and a half inches from the ileocecal junction was found a non-perforated membrane completely occluding the lumen of the ileum. The small intestine was distended to the area of the mass and the per-

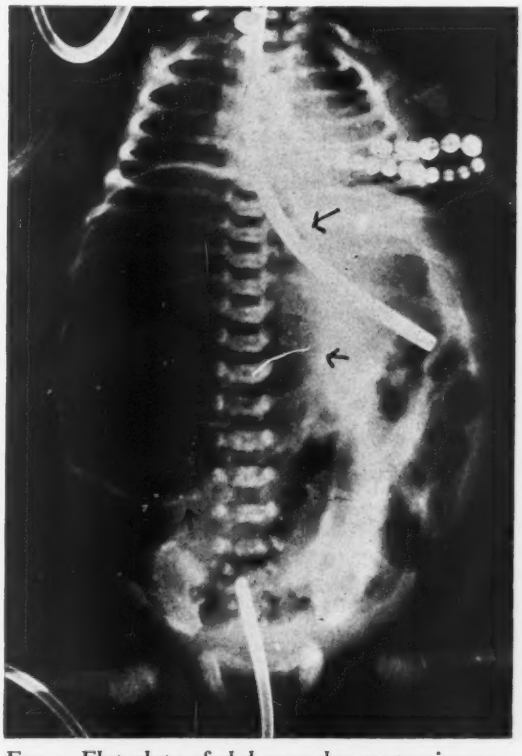

FIG. 1. Flat plate of abdomen demonstrating tremendous distention of the small intestine in right half of abdomen. Distended loops are also visible in left half indicating an adynamic ileus compatible with peritonitis. A catheter is noted in the stomach, another is seen in the rectum (Case 1).

* From the Surgical Services of Dr. Nicholas H. Ryan and Dr. Ottokar Tenopyr, Kings County Hospital, Brooklyn.

foration. The large intestine was collapsed throughout its entire length. The matted ileum, including the membranous area was resected.

FIG. 2. Flat plate *x*-ray of abdomen showing a mass in right upper half of the abdomen. Intussusception suggested in transverse colon (Case II).

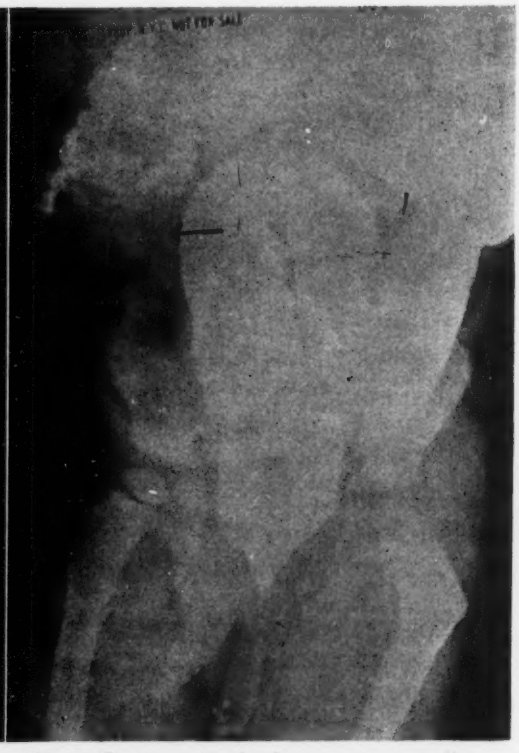

FIG. 3. Preoperative barium enema revealing an obstructive process due to an intussusception in the ascending colon. Barium has pushed the intussusception from the transverse to the ascending colon (Case II).

A side-to-side ileocolostomy was then performed. Routine closure of the abdomen was accomplished. The condition of the infant on leaving the operating room was very poor. Ten hours after the operation the infant died. Autopsy study attributed the death to meconium peritonitis.

Comment. Congenital atresia of the ileum is not seen frequently. Without surgical intervention death from dehydration and inanition is inevitable. Atresia of the small intestine occurs in two forms. One type is an internal membrane occluding the lumen. The second type is a sudden ending of the intestinal tract as a blind sac.[1]

Ladd and Gross report forty-one cases in which the patients were operated upon for congenital atresia of the ileum with only five patients surviving. Hence it can be appreciated how uncommon is this entity and how high is the operative mortality. It is rare to find this condition associated with a perforation proximal to the atresia as recorded in this case.

In the discussion of this subject Ladd and Gross mention Farber's test as an aid in diagnosis. This is a microscopic test whereby the meconium of an infant can be quickly examined and the presence or absence of swallowed vernix cells can be determined. This is performed by staining a fresh specimen of meconium on a slide with gentian violet and then examining the specimen under a microscope. In any newly born child with intestinal obstruction, the absence of cornified epithelial cells in the meconium is presumptive evidence that an intestinal atresia exists.[1]

CASE II. This is the case history of a twenty-three month old colored boy who was admitted to the pediatric medical service on

June 23, 1943. The history was one of constipation of five days' duration. Small fecal particles were passed by rectum on alternating days during this five-day period. It was noted that the child would hold his abdomen with his hands and flex his legs on the abdomen. He would do this innumerable times. Associated with this procedure was the facial expression of pain. Vomiting occurred twice during the physical examination. Oliguria was present since the onset of symptoms. No blood was passed by rectum; none was found on the examiner's finger.

On admission the temperature, pulse and respirations were within normal limits. The abdominal findings at this time were non-revealing. The abdomen was soft, no tenderness could be elicited, no masses were palpable. A small umbilical hernia was present. Laboratory and blood studies were normal.

On June 28th, five days after admission, a surgical consultation was requested. The patient was accepted on the surgical service with the tentative diagnosis of intestinal obstruction possibly due to an intussusception. *X*-ray studies were requested. (Figs. 2 and 3.)

At this time the patient had several loose, brown, watery stools. He retained fluids by mouth but no solid food. The next day the abdomen became moderately rigid on the right side; tenderness could be elicited in the right lower quadrant. A questionable mass could be felt in the right lower quadrant. There was no blood per rectum and no mass could be felt by digital rectal examination. All this time the temperature and pulse rate did not rise.

Surgery was advised after intravenous fluids and a blood transfusion had been given. The patient underwent an exploratory laparotomy on the seventh day of admission to the hospital. The abdomen was opened through a right paramedian incision. A moderate amount of clear, yellow fluid was aspirated from the peritoneal cavity. A double intussusception was found in the right colon extending up to the hepatic flexure. The terminal ileum was invaginated into the cecum. The cecum in turn was invaginated into the ascending colon up to the hepatic flexure. The appendix was drawn into the ascending colon by the cecum. The appendix was reddened, edematous, congested and macroscopically enlarged. The lateral ligamentous fold of the ascending colon was absent. The right half of the colon was extremely mobile. The intussusception was reduced in the orthodox fashion. The intestine was viable. A small amount of hemorrhage in the serosa of the cecum was present. Slight to moderate edema of the cecum was noted. After the reduction of the intussusception an appendectomy was performed. The terminal portion of the ileum and the cecum were sutured down to the posterior parietal peritoneum. Abdominal closure was accomplished in the routine fashion.

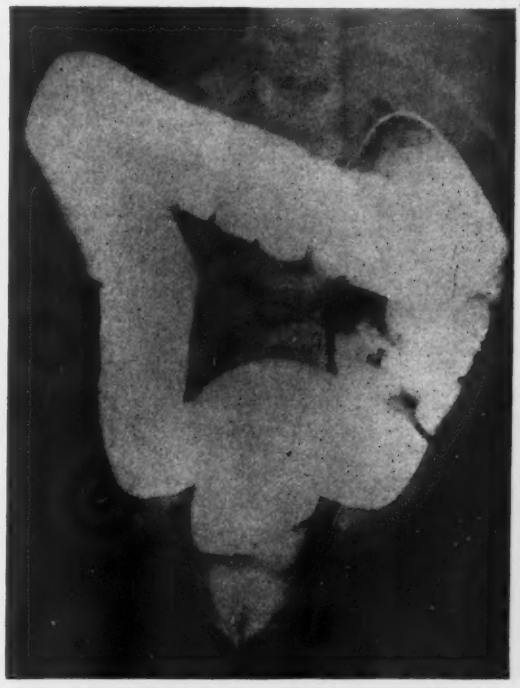

Fig. 4. Postoperative barium examination revealing no obstruction to the passage of the opaque material through the entire colon. The intussusception formerly present is completely reduced (Case 11).

Postoperatively the patient was given intravenous fluids. On the second postoperative day the temperature rose to 102°F. on one occasion. Abdominal distention on the third and fourth days was combatted with Wangensteen suction. No other complication developed. Four weeks after the operation a barium study of the colon showed complete reduction of the intussusception. (Fig. 4.)

Comment. Intussusception is a surgical disease infrequently seen. Over a thirty-year period Ladd and Gross reported 484 cases. Of this number only 1 per cent showed multiple intussusception. Thus the rarity of this state is readily appreciated.

Intussusception in childhood may find an etiological basis in a Meckel's diverticulum, intestinal polyp, lymphoma or duplication. In most instances no etiological agent can be found.[1] In the case reported, it is believed that the free mobility of the ascending colon, due to the absence of a lateral attachment, was a contributing factor.

Intussusceptions are spoken of in compound terms which indicate the portion of the intestine (intussusceptum) which telescopes into the intussuscipiens.[1] Multiple types are reported. These are usually ileo-ileo-colic.[1] Ladd and Gross do not mention an ileo-cecal-cecal-colic type as found in this case. This we believe to be a rare condition.

The other unusual features of this case were the delayed physical findings, and the absence of bloody stools with a complex pathological process. Another interesting aspect was the long interval between the onset of symptoms and the time of operation. Prolonged delay such as this almost always terminates fatally. The explanation offered for the bizarre clinical picture is that the intussusception reduced itself only to recur.

SUMMARY

Two unusual pediatric cases are presented. The first is a congenital atresia of the ileum associated with spontaneous intestinal perforation in a premature infant. This infant developed signs of an intestinal obstruction within twenty-four hours after birth. Surgical intervention failed in the presence of an extensive peritonitis.

The second case is a double intussusception in a twenty-three months old boy who presented a five-day history prior to entering the hospital. An additional delay of seven days occurred before surgical relief of the intussusception was accomplished. Notwithstanding this prolonged delay, the patient had an uneventful recovery.

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INTESTINAL OBSTRUCTION ASSOCIATED WITH DEFECTS IN THE BROAD LIGAMENTS OF THE UTERUS

REVIEW OF LITERATURE AND CASE REPORT

T. V. GOODE, M.D.
Chief Surgeon, H. F. Long Hospital
STATESVILLE, NORTH CAROLINA

AND

MAJOR WALTER R. NEWBERN
MEDICAL CORPS, ARMY OF THE UNITED STATES

INTESTINAL obstruction following protrusions and strangulation of loops of bowel through defects in the broad ligaments of the uterus is decidedly uncommon, and only twenty-seven such cases are to be found in the literature. Nine of these cases are definitely associated with the Baldy-Webster operation for uterine suspension and one case was found during a third cesarean operation. There are four additional cases reported in the literature of broad ligament defects which are not associated with intestinal obstruction. It is interesting to note that many of these cases are referred to as "broad ligament hernias" when actually they are protrusions of loops of intestine through fenestra in the broad ligament without any form of hernial sac. These cases should more correctly be called "intestinal obstruction by strangulation into or through the broad ligaments." In this paper such a case is presented and reference is made to other cases thus far reported in the literature which are definitely related to broad ligament defects.

CASE REPORT

Mrs. H. C. B., age forty-two years, entered the H. F. Long Hospital January 12, 1941, with severe lower abdominal cramping pain which was accompanied by nausea and vomiting of eight hours' duration. She was awakened at 5:00 A.M. on the day of entry into the hospital with severe cramping pain in the hypogastrium. The pain gradually increased in severity, became continuous and agonizing, and was accompanied by regular intermittent colicky pains of short duration which radiated straight upward to the epigastrium. Nausea was almost continuous but during the episodes of colicky pain it became more intense and on three occasions was accompanied by vomiting. The patient was given morphine by the family physician shortly after the onset of pain but this produced only slight relief. The patient then sought relief by lying on her left side with the lower extremities flexed onto the abdomen, but the symptoms continued without abate until admission to the hospital at 12:00 noon.

During the past year the patient had noticed morning nausea but this was never accompanied by pain, vomiting, or any disturbance of bowel habits. On the day prior to the onset of her illness she had a good bowel movement and felt quite well, and during the evening took several high balls and ate much rich food.

Her general health in the past had always been excellent and there had been no operations or significant injuries. The last menstrual period occurred on January 4, 1941, and was of the usual duration and flow. There had been three pregnancies; all the children were living and well and at the present time were fifteen, ten, and five years old, respectively. The first pregnancy necessitated a version extraction for abnormal presentation, but the others were normal labors. Further history is noncontributory.

Examination on entry into the hospital showed a well developed, acutely ill woman tossing about in bed and complaining of severe lower abdominal pain. Her temperature was 97°F., pulse 78, respirations 18, and blood pressure 120/72. There was slight abdominal tenderness and increased muscle tone just above the symphysis pubis, but no distention, masses, or increased audible peristalsis. Pelvic examination showed a normal size retroverted uterus which was tender on manipulation. There was tenderness in the left fornix but no

palpable masses. The remainder of the physical examination was normal.

Laboratory findings on admission: Hemoglobin, 77 per cent (16 Gm. Dare method); white blood count, 6,700, polymorphonuclears, 72 per cent, coagulation time, three minutes; urinalysis essentially negative and Kahn test negative.

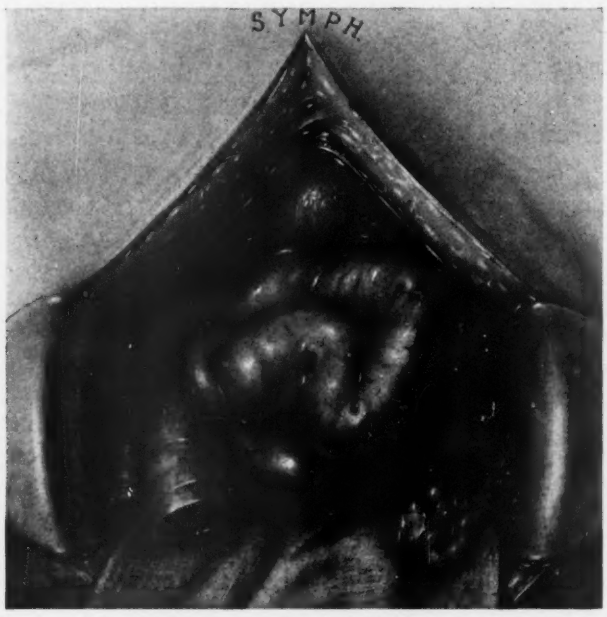

FIG. 1. A loop of ileum protruding through a defect in the left *meso-ligamentum teres* and partially obstructed by the round ligament which at this level is greatly hypertrophied. The uterus is retroverted but freely movable. Pelvic organs are otherwise normal.

It was decided that an immediate laparatomy was inadvisable because of the lack of definite objective signs. The patient was given nothing by mouth, intravenous fluids, and opiates for relief of pain. However, the pain continued but did not appear to increase in severity and she vomited only a few times. The vomitus was always clear and watery and very small in quantity. Temperature, pulse, and respiration remained well within normal limits. Daily blood counts and urine examination were always within normal limits. The abdomen was never distended and she continued to have small daily stools without blood or mucus.

Due to persistence of symptoms the abdomen was explored four days after admission to the hospital. On opening the abdomen through a midline suprapubic incision, loops of distended small intestine and increased cloudy peritoneal fluid were encountered. The obstruction was traced to the left pelvis where a loop of terminal ileum 18 inches long was found strangulated beneath the left round ligament. The bowel entered superiorly through an opening beneath the round ligament and lay anteriorly on the broad ligament and uterus. (Fig. 1.) The bowel was easily released by gentle traction, and though it was quite distended and discolored it was viable and soon regained normal appearance. The opening through the left meso-ligamentum teres of the anterior leaf of the broad ligament was 3 cm. in diameter. The round ligament at this level was greatly hypertrophied and approximately three times its normal size. Further inspection of pelvic viscera was negative. The defect was closed by suturing its edges securely with chromic catgut No. 0 to the round ligament above. Recovery was uneventful and the patient left the hospital on the twentieth postoperative day.

The patient has had no recurrence of symptoms during the past two and one-half years since operation. (Fig. 1.)

LITERATURE

The earliest record of intestinal obstruction by strangulation of loops of bowel into or through the broad ligament was in 1861 when Quain reported the autopsy findings

of a woman who died as a result of this type of obstruction without intervening surgical treatment. This is the only case to appear in the literature prior to the twentieth century.

In 1910, Barnard stated that hernia may occur into pouches in the broad ligament and mentioned that there was such a case in the Museum of the London Hospital, but this case could not be traced by Pidcock. A monograph by Moynihan in 1906, "Internal Hernia" contains no reference to broad ligament hernia, and Watson's "Hernia" likewise does not refer to this condition.

Fagge, in 1917, reported two cases of strangulated hernia into the broad ligament, the first instance of surgical intervention in the literature. In 1920, Barr reported another similar case and during the same year the first instance of intestinal obstruction following and definitely associated with the Webster-Baldy operation was reported by Richardson. Pidcock reported another case in 1924, of strangulation of a loop of bowel through an aperture in the broad ligament and discussed the possible etiology of this condition. In 1926, Dunn reported a case in which there was a fenestra 5 cm. in diameter in the mesosalpinx of both broad ligaments without strangulation of the bowel. In 1928, Dorman described a case of true broad ligament "hernia" similar to a Richter's hernia, in which a knuckle of intestine was strangulated in a sac formed by an invagination of peritoneum on the posterior surface of the left broad ligament. Stimson added another case in 1928 and Janes two cases in 1929, of intestinal strangulation through openings in the broad ligaments. Pemberton and Sager, in 1929, reported two cases following the Webster-Baldy operation. Caplan, in 1930, and Cooper, in 1931, added two other cases of strangulation of bowel into the broad ligament and referred to another case of Hermann in 1925, and reviewed the literature in an excellent manner. Masson and Atkinson reviewed the literature in 1934 and reported a case of herniation of the right ovary and part of the Fallopian tube into a fold of the right broad ligament. In 1937, Reineke reported the autopsy findings of a case of intestinal obstruction through or into an opening in the right mesosalpinx, and Füssell reported a similar case in 1938 in which the patient expired two days after operation. Likewise, in 1938, Pohn and Votquenne reported a case of "strangulated hernia in hiatus of broad ligament after Baldy Dartigues operation for retroversion of the uterus." Also during that year Masmonteil and Vautier reported a case of intestinal obstruction during pregnancy where the sigmoid was strangulated in a breach of the broad ligament. In 1939, Bowles reported two cases, one, of strangulation of the bowel through the left mesosalpinx, and another which followed the Webster-Baldy operation. During the same year Parks and Karabin reported a case following the Webster-Baldy operation and referred to two other similar cases. In 1940, Bartsch presented a case of "strangulation of intestine due to hiatus formation in broad ligament." Koch reported two cases in 1940, one, which was quite similar to the author's in which a loop of ileum was strangulated beneath the left round ligament, and another case of intestinal obstruction following the Webster-Baldy operation. Shephard and Waugh reported an unusual case in 1924 of hernia into the suspensory ligament of the right ovary producing acute intestinal obstruction. In this case the defect was 1¼ inches in diameter and was thought to be congenital in origin.

Thus a total of thirty-one cases from the literature and the case presented here represent all known cases to date of fenestra or defects in the broad ligaments of the uterus which may or may not be associated with intestinal obstruction.

ANATOMY

Anatomically, the broad ligament is a reflection of peritoneum extending laterally from the surface of the uterus to the pelvic

walls with the tubes and round ligaments acting as ridgepoles. The Fallopian tubes being somewhat superior and posterior to the round ligaments are covered by the same reflection of peritoneum, except at the fimbria, and mark the superior boundary of the broad ligaments. Laterally, the peritoneum extends to the pelvic wall covering the ovarian vessels to form the infundibulo-pelvic ligament or the suspensory ligament of the ovary.

The ovary is located on the posterior aspect of the broad ligament beneath the tube and ligamentum proprium ovarii, the latter representing a thickening of the posterior layer of the broad ligament extending between the ovary and the cornu of the uterus. This ovarian ligament divides the broad ligament into two parts; the upper triangular portion being the *mesosalpinx* and is bounded by the uterus medially, the ovary laterally, and the Fallopian tube superiorly. The lower portion is actually the broad ligament proper and contains a shallow fossa immediately above the round ligament where the folds of peritoneum forming the broad ligament are in close apposition and are quite devoid of connective tissue support and adequate blood supply. The round ligaments on each side stretching, ordinarily lax, between the canal of Nuck and the anterolateral surface of the uterus are covered by the anterior layer of the broad ligaments to form the *mesoligamentum teres.*

Where the peritoneum is reflected on the pelvic wall the loose connective tissue between the folds of the broad ligament become continuous with the connective tissue of the pelvic floor and forms a rather strong support to the broad ligaments.

COMMENT

Except in those cases associated with previous pelvic surgery, it is difficult to determine the etiology of broad ligament defects. Such defects are probably congenital in origin because it is inconceivable that trauma could be an etiological factor. It is likely that pregnancy plays an important rôle because it was found in the literature that only three of the seventeen patients, not operated upon previously, were definitely nulliparous. The average age of these seventeen patients was about forty-three years, the youngest, an eighteen year old nulliparous woman whose broad ligament defect was found during an operation for ovarian tumor, and the oldest a seventy year old multiparous woman with complete intestinal obstruction. In only one instance did intestinal obstruction occur during or shortly after the termination of pregnancy, which would tend to disprove any theory of intra-abdominal pressure during pregnancy and labor producing a tear or defect in the broad ligament with subsequent strangulation of the bowel.

An interesting observation is that the defects in sixteen patients, without previous surgery, were located in the region of the mesosalpinx involving both layers of the broad ligament. There are two cases of "pouch" formation located on the posterior surface of the broad ligament and two cases of protrusion of a loop of bowel beneath the round ligament similar to the case presented above.

Despite the fact that the mesosalpinx is a thin avascular region of the broad ligament it is unlikely that stretching or direct pressure by loops of bowel could produce these defects. However, trauma by repeated protrusions of loops of intestine into congenital fenestra might produce sufficient inflammation with resultant fibrous tissue sufficiently strong to strangulate the bowel. Thus it is to be expected that the actual production of the condition necessary for intestinal obstruction requires many years of this repeated mild trauma. Such must be the case since the average age of patients with this condition is about forty-three years.

Those cases without intestinal obstruction were found to have quite large defects incapable of producing constriction of the bowel. Thus the size of the defect, the amount of tissue resistance locally in the

form of a fibrous rim about the fenestra, and the age of the patient must all be factors in producing this type of intestinal obstruction.

Intestinal obstruction following the Webster-Baldy operation for uterine suspension has already been nicely presented by Parkes and Karabin, and the broad ligament defects have been attributed to a technical error in performing this operative procedure. Here the openings in the broad ligament have occurred at the point where the round ligament was brought through to be sutured to the posterior surface of the uterus. In order to prevent such complications the technic as outlined originally should be closely followed. Care should be taken to perforate the broad ligament immediately below the ovarian ligament and proximal to the uterus. The openings in the broad ligament should only be large enough to permit the pulling through of the round ligaments, and at the end of the procedure the edges of the openings in the broad ligaments should be carefully sutured to the round ligaments so that no opening or raw surface is left.

DIAGNOSIS

An accurate preoperative diagnosis of this condition has not yet been made, although Pemberton and Sager once diagnosed an incarcerated intra-abdominal hernia which at operation was found to be strangulation of a loop of bowel through an opening in the left broad ligament. Diagnosis is quite difficult when there is partial intestinal obstruction as shown in the case presented above. In this case all symptoms and signs were entirely subjective except the occasional vomiting of clear gastric contents, and the slight tenderness on manipulation of the uterus. During the three days prior to operation there was a constant lack of fever, leucocytosis, abdominal distention, and persistent vomiting. Exploration of the abdomen was performed, for the most part, only because of persistent abdominal pain.

In cases with complete intestinal obstruction a preoperative diagnosis can be made. Signs of complete obstruction in a multiparous woman with pelvic tenderness and a mass in the region of the broad ligament without evidence of acute pelvic inflammatory disease should make such a diagnosis quite likely. History of previous pelvic surgery is likewise significant.

Treatment is always surgical. Abdominal exploration should be performed as early as possible after onset of symptoms because this alone will influence the prognosis and mortality rate. At operation an attempt should be made to obliterate the broad ligament defect even at the expense of the tube and ovary. The importance of using non-absorbable suture cannot be too greatly stressed when this method of repair of the defects is used.

SUMMARY

1. A case of intestinal obstruction associated with a defect in the broad ligament of the uterus is presented along with a review of the literature.

2. Those cases associated with previous pelvic surgery particularly the Baldy-Webster suspension operation, were discussed only briefly.

3. Defects in the broad ligaments which are not associated with previous pelvic surgery must be congenital in origin, although repeated trauma must play an important rôle.

4. A definite preoperative diagnosis is difficult to make in the absence of complete intestinal obstruction and a definite history of previous pelvic surgery.

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PEPTIC ULCER PERFORATING INTO THE ANTERIOR ABDOMINAL WALL*

CARL G. MORLOCK, M.D.
Division of Medicine, Mayo Clinic
ROCHESTER, MINNESOTA

AND

CAPTAIN WALTMAN WALTERS
MEDICAL CORPS, UNITED STATES NAVAL RESERVE

CHRONIC, slowly progressive perforation is a common complication of peptic ulcer. If the ulcer becomes attached to an adjacent organ, it may continue its penetration into the substance of that organ. Eusterman and Balfour stated that solid organs are very resistant to such penetration. Eberhardt, at the necropsy of a patient who had died of carcinoma of the colon, found a huge ulcer of the stomach which had penetrated through the diaphragm, had attached itself to the wall of the left ventricle of the heart and had burrowed into the ventricular muscle to a depth of 3 mm. The frequency with which duodenal ulcer penetrates into the substance of the pancreas is well known.

Eusterman and Balfour stated that perforation, whether it be acute, subacute or chronic, is characteristic of the majority of jejunal ulcers. They stated that this perforation in order of frequency occurs, first, into the peritoneal folds, second, into the colon, and third, into the abdominal wall. The infrequency with which peptic ulcer penetrates into the anterior abdominal wall is attested by the paucity of reports of this complication. Plewniak reported the occurrence of a gastric ulcer which became attached to the anterior abdominal wall, penetrating into it and forming an inflammatory mass the size of two fists. Petrov reported a jejunal ulcer which perforated into the anterior abdominal wall twelve years after gastroenterostomy had been performed. Recht reported a case in which a perforating jejunal ulcer had become attached to the anterior abdominal wall and subsequently burrowed through the abdominal wall to form an external fistula with the discharge of gastric contents. Recht, in calling attention to the infrequency with which the complication attends jejunal ulceration, credited Schwartz with having collected data on fifty-three cases in which a jejunal ulcer had become implanted on the anterior abdominal wall.

We recently had the opportunity of observing a jejunal ulcer which had perforated into the anterior abdominal wall. Subsequently we were able to find two additional similar cases in the files of the Mayo Clinic.

CASE REPORTS

CASE 1. A man, aged sixty-eight years, was examined in 1939 at the Mayo Clinic because of stomach trouble. He had had some form of indigestion for at least thirty-seven years. He had been a moderate user of alcohol and tobacco throughout his adult life. He was first seen at the clinic in 1915, when a diagnosis of duodenal ulcer was made. At that time posterior gastrojejunostomy was performed for a chronic perforating duodenal ulcer. An excellent result followed this procedure and the patient remained symptom free for twelve years. In 1927, he had a recurrence of severe gastric pain which was uncontrolled by the usual medical measures formerly effective. His abdomen was explored in 1927 elsewhere. The original gastrojejunal stoma was not disturbed, and anterior gastrojejunostomy was performed. An uncomplicated recovery followed this second operation and he remained well except for transient digestive discomfort until 1939.

* The opinions and assertions contained herein are the private ones of the writers and are not to be considered as official or reflecting the views of the Navy Department or the naval service at large.

Ten weeks before the patient's admission in December, 1939, he had noted a painful tumor in the site of the scar of his previous laparotomy incision. This tumor had increased in size slowly until it had measured approximaterly 2½ inches (6.25 cm). in diameter. There had been no return of significant digestive distress and his health in general was excellent.

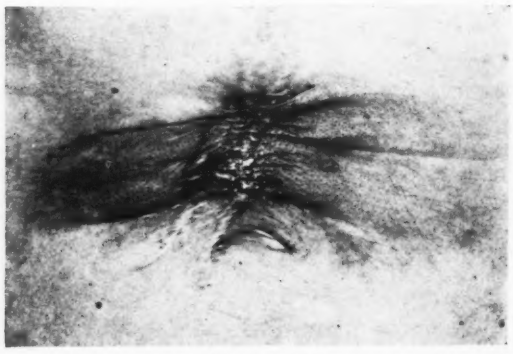

Fig. 1. Anterior abdominal wall showing the deformity secondary to the inflammatory reaction caused by a contiguous gastrojejunal ulcer.

The patient was tall and asthenic and weighed 20 pounds (9.1 kg.) less than the weight that was ideal for him. The mid-epigastric wall was involved by a brawny red indurated mass measuring 6.25 cm. in diameter. The skin over this region was thrown into coarse irregular folds. (Fig. 1.) There was a small right inguinal hernia. The systolic blood pressure was 180 mm. of mercury; the diastolic was 100 mm. The voided urine was normal. The concentration of hemoglobin was 12.7 Gm. per 100 cc. of blood; the leukocytes numbered 8,200 per cubic millimeter of blood. The Kline, Kahn, Hinton and Kolmer Wassermann tests of the blood serum gave normal results. A modified Ewald test meal showed a total acidity of 60 (according to the method of Töpfer), a free hydrochloric acid of 50 and total aspirated contents of 60 cc. A roentgenogram of the stomach was reported as follows: "The distal third of the stomach is badly scarred from previous gastric operations which have interfered with normal physiology. There is a low gastro-enterostomy with a jejunal ulcer and rather marked jejunitis." (Fig. 2.) A roentgenogram of the thorax did not show any abnormality.

An operation was performed on January 5, 1940, by one of us (W. W.). It was found that the mass in the abdominal wall formed the base of a huge gastrojejunal ulcer. This ulcer arose from the anterior portion of an anterior gastrojejunal stoma that had been made secondarily elsewhere. The crater of the ulcer was approximating 4.5 cm. in diameter and was removed with a portion of the abdominal wall including the umbilicus. The original posterior gastrojejunal stoma made twenty-five years before had contracted so that it measured approximately 1.2 cm. in diameter. A scarred, healed duodenal ulcer narrowed the duodenum to half its normal diameter. (Fig. 3.)

Fig. 2. Great deformity of the lower third of the stomach and at (x) area of jejunitis. The jejunal ulcer visualized at roentgenoscopic examination is not visible in the roentgenogram.

The posterior gastrojejunal stoma was taken down, the duodenum was divided just below the pylorus and four-fifths of the body of the stomach was resected. Gastrointestinal continuity was re-established by means of a posterior Pólya type of anastomosis, approximating to the stomach a loop of jejunum about 7.5 cm. distal to the second opening, which had been made by the anterior gastrojejunostomy and which was closed at this time.

The postoperative course was complicated by bronchopneumonia, but the patient made a good recovery eventually and was dismissed from our care two months from the time of admission.

CASE II. A white man, aged thirty-six years, was first seen at the clinic in 1914. At that time he gave a history of an ulcer type of dyspepsia of one year's duration. Physical examination gave normal findings. The Kolmer Wassermann reaction of the blood was negative. A modified Ewald test meal revealed total acidity of 64 (according to the method of Töpfer), a free hydrochloric acid of 52 and total aspirated contents of 100 cc. A roentgenogram of the stomach was indeterminate.

The patient returned in 1917 because of persistent gastric distress. Abdominal exploration was done and posterior gastrojejunostomy performed for a chronic perforating duodenal ulcer. He remained well after this for sixteen months and then experienced recurrent pain, situated to the left of the umbilicus. A roentgenogram revealed a jejunal ulcer. Abdominal exploration was performed in September, 1918. A jejunal ulcer was found adherent to the colon and reducing the gastrojejunal stoma to half its normal size. The anastomosis between the stomach and the jejunum was disconnected and the openings in the stomach and the jejunum were closed. A second gastrojejunostomy was performed with the stoma somewhat nearer the pylorus. Two years after this second operation the patient had a return of symptoms. In 1924, a jejunal ulcer was demonstrated by roentgenogram. In 1926, he discovered a tender mass in the upper end of the laparotomy scar. Examination revealed moderate local inflammatory changes about this mass.

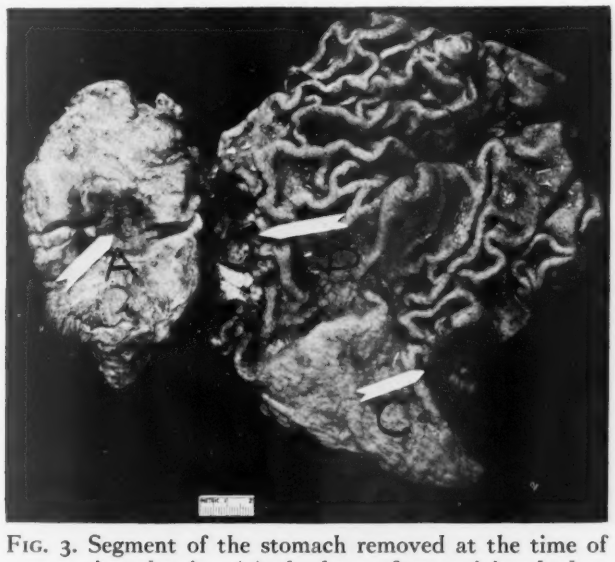

FIG. 3. Segment of the stomach removed at the time of operation showing (A) the base of gastrojejunal ulcer perforating into the anterior abdominal wall; (B) site of anterior gastrojejunostomy; (C) site of obsolete posterior gastrojejunostomy.

An operation was performed in November, 1926. When the abdomen was opened, it was found that the palpable mass was due to inflammatory reaction about an ulcer which arose from the anterior gastric wall. This ulcer had become attached to the anterior abdominal wall, penetrating through the entire wall and forming a crater whose base was beginning to penetrate into the skin itself. The base of the ulcer measured 2.5 cm. in diameter. Because of the secondary inflammatory reaction it was impossible to mobilize the stomach sufficiently to permit removal of the lesion. The ulcer was therefore oversewed and ten days later a secondary operation was performed. At this time it was found that the anastomosis present was an anterior gastrojejunostomy. There was a jejunal ulcer arising from the site of the anastomosis and slightly to the left of the gastric ulcer previously found. This jejunal ulcer was penetrating into the anterior abdominal wall. The stomach was mobilized and the lower half resected. The gastrointestinal continuity was re-established by a Balfour Pólya type of anastomosis. The patient made a good recovery after a stormy convalescence. His gastric symptoms were well controlled for eight years after this operation. He died in 1934 after a severe gastric hemorrhage.

Case III.* A man, aged thirty-seven years, registered at the clinic in 1923. He gave a history of having had recurrent epigastric distress for approximately ten years. In 1915, appendectomy had been performed. In 1916, gastro-enterostomy for chronic duodenal ulcer was performed. One month after this operation there was recurrence of distress which had shifted its location to the left and slightly lower as compared with his original distress. This recurrent pain was not relieved as promptly by the ingestion of food as was his pain before the operation. He followed a modified ulcer dietary regimen for several years but failed to obtain good relief therefrom.

On examination there was evidence of recent loss of weight. There was a palpable mass in or just beneath the abdominal wall to the left of the midline. The blood pressure was 106 mm. of mercury systolic and 80 diastolic. Urinalysis gave normal results. The concentration of hemoglobin was 79 per cent (Dare); the leukocytes numbered 7,300 per cubic millimeter. The blood Wassermann reaction was negative. A modified Ewald test meal showed a total acidity of 56 (according to the method of Töpfer) and free hydrochloric acid of 42. A roentgenogram showed a negative stomach and a functioning gastro-enteric stoma.

The stomach was explored in June, 1923. It was found that an anterior gastrojejunal stoma had been made at a previous operation. The anterior wall of the stomach was adherent to the anterior abdominal wall, and when these structures were separated, an ulcer arising from the edge of the gastro-enteric stoma was seen penetrating into the substance of the abdominal wall. The crater of the ulcer measured 1 cm. in diameter and 1 cm. in depth. The pylorus was contracted to ¼ inch (0.6 cm.) in diameter. The crater of the ulcer was excised, the anterior lip of the gastrojejunal stoma was reconstructed and the area protected by a portion of omentum.

A return of ulcer-like abdominal pain was experienced one year after this operation. This distress was located in the left upper quadrant of the abdomen with occasional extension into the scrotum and inner aspect of the left thigh. The pain was relieved by the taking of an alkaline powder.

In 1926, a tender mass was palpable in the left half of the abdomen. This mass seemed to be attached to the anterior abdominal wall. The patient was underweight and dehydrated. A roentgenogram revealed a gastrojejunal ulcer. After a few days of preparation an abdominal exploration was performed. An ulcer was found to be arising from the anterior portion of the gastrojejunal stoma. This ulcer had become attached to the anterior abdominal wall and had penetrated into it, forming a crater 2 cm. in depth and 4 cm. in diameter. The crater in the abdominal wall was excised, the gastro-enteric stoma was disconnected and the removal of two-thirds of the stomach effected by resection. Gastrointestinal continuity was re-established by means of a Balfour Pólya type of anastomosis. The patient made an uncomplicated recovery from this operation and an inquiry nine years later revealed that he had not had any return of digestive disturbance during that time.

* Previously reported by Nickel and Hufford.

COMMENT

We should like to draw attention to the fact that the complication of peptic ulcer manifested in these three cases is one which is infrequently seen. That penetration of a peptic ulcer into the anterior abdominal wall can occur is evident. In our second case this penetration had extended into the skin and there seemed to be a possibility of actual formation of fistula, a complication which Recht observed. All our patients had had previous operations on their stomachs, and in each instance anterior gastrojejunostomy had been performed. In each instance the offending lesion was an ulcer arising in the anterior rim of the anterior gastrojejunal stoma. It is apparent that in order that a peptic ulcer can attach itself to the anterior abdominal wall and secondarily penetrate into it, the ulcer must have its origin from a part of the stomach wall which is adjacent to the abdominal wall. A gastrojejunal ulcer arising on the anterior rim of an anterior gastrojejunal stoma is, therefore, peculiarly likely to penetrate in such a way as to result in this complication.

When it is decided that gastrojejunostomy is the procedure of choice in the

surgical treatment of duodenal ulcer, posterior anastomosis is always done in preference to anterior anastomosis. A better functional result is achieved by the former procedure. Anterior gastrojejunostomy is done only when posterior anastomosis is not technically feasible and this is uncommon. For these reasons anterior gastrojejunostomy is performed in very few cases and consequently few gastrojejunal ulcers are situated in a location which makes anterior penetration of the ulcer into the anterior abdominal wall anatomically possible. Although it is possible for a gastric ulcer having its origin in a part of the anterior gastric wall adjacent to the anterior abdominal wall to penetrate into the abdominal wall as Plewniak observed, this complication must be exceedingly rare in a stomach which has not been previously disturbed by operation. In Case II two ulcers were found penetrating into the anterior abdominal wall; one proved to have its origin in the gastric wall, the other arose from the jejunum.

SUMMARY

Three cases are reported in which a benign peptic ulcer occurred at the stoma of an anterior gastrojejunostomy. These ulcers became attached to and burrowed deeply into the anterior abdominal wall. This is a rare complication of peptic ulcer. When it occurs, it must be treated surgically.

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VALVULAR GASTROSTOMY*

M. E. STEINBERG, M.D.
On Attending Staff, Emanuel Hospital
PORTLAND, OREGON

WHEN the surgeon has the occasion to perform a gastrostomy, he may choose from a number of well established methods. In a recent article, the writer pointed out the disadvantages of the fistulous tracts lined by serosa.[1] In spite of the ease with which the Witzel and other similar types of gastrostomies are performed, they have their disadvantages, since leakage and soiling cannot always be prevented. A rubber tube must be permanently in place; otherwise the fistula may close up. On the other hand, there is no danger of any pedicle tube gastrostomy closing up because it is lined with stomach mucosa. The Beck-Jianu[2] gastrostomy demands the sacrifice of a large part of the stomach along the greater curvature. The Janeway[3] and the Spivac[4] methods sacrifice less of the stomach wall and eliminate the danger of hourglass formation. I have had no personal experience with the double-valve gastrostomy described by Glassman.[5] It appears to be a simple and safe procedure.

In a recent communication the writer proposed a valvular form of gastrostomy fashioned from a flap of the anterior stomach wall. (Figs. 1, 2 and 3.) First a channel was formed by suturing the seromuscularis over a rubber tube. Such a pedicle tube was rather long and maintained its continuity with the main body of the stomach by a narrow base. This pedicle tube was then invaginated upon itself, creating a valve-like structure resembling the ileocecal valve, only much longer in its lumen. This type of gastrostomy was performed in one patient with carcinoma of the esophagus and it functioned efficiently. Although the length of the pedicle tube was about the same as that in the Janeway or Spivac methods, it appeared to be unsafe, since the invagination upon itself might have a tendency to strangulate the blood supply to the terminal part of the tube.

In the newest technic depicted in the illustrations, one can see that the length of the finished gastrostomy remains about the same as in the original one. This was accomplished by separating only the terminal half of the pedicle tube from its continuity with the main body of the stomach. The proximal half of the pedicle tube closer to the greater curvature has not been disturbed. Such a procedure allows the blood supply to come in from all sides of the main body of the stomach to the distal half of the gastrostomy tube. By providing a wider diameter in the proximal half of the channel, no strangulation should take place after the invagination of the narrow terminal half of the gastrostomy tube. Such invagination was accomplished with ease. The illustrations depict the various steps of the operation.

CASE REPORT

R. G. H., Case No. B-38975, a male, age fifty-eight, was admitted on October 14, 1942, because of difficulty in swallowing and of vomiting recently swallowed food, gas on the stomach, and loss of weight. This patient had enjoyed very good health until about three years ago, when he began to notice considerable abdominal gas after meals. This gas seemed to have no relation to the food eaten, and continued to occur until the present time. About five months ago he noticed difficulty in swallowing large pieces of food. This condition has become considerably worse. During the past two months his diet has been largely

* From the Department of Physiology, University of Oregon Medical School.

Fig. 1.

Fig. 2.

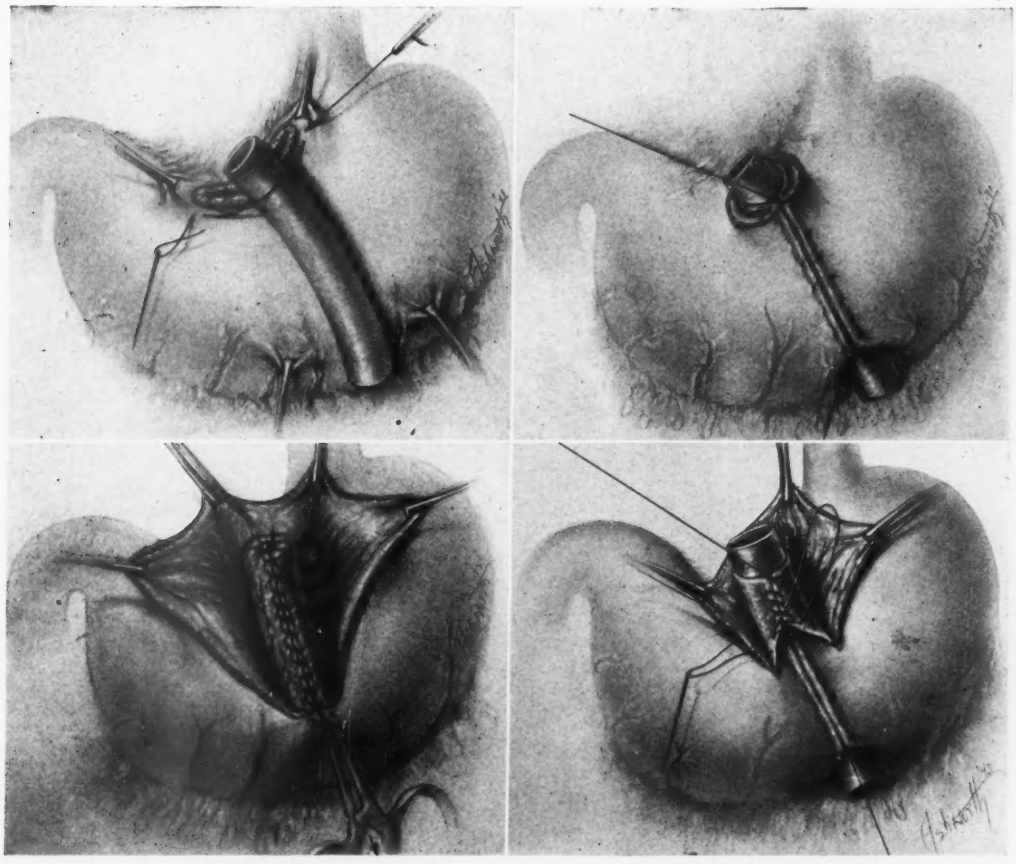

Fig. 3.

Fig. 4.

Fig. 1. Incision parallel to the lesser curvature; suturing of the seromuscularis over the rubber tube.

Fig. 2. A tunnel was formed by the approximation of the anterior stomach wall over the rubber tube.

Fig. 3. This illustrates the method used in the original operation. The whole serosa lined channel down to its base has been separated from the main body of the stomach. This procedure has been discarded, since it might endanger the blood supply to the terminal end of the pedicle tube; particularly so after its invagination upon itself. (See Figure 6 for comparison.)

Fig. 4. Suturing of the stomach mucosa over the distal half of the tube.

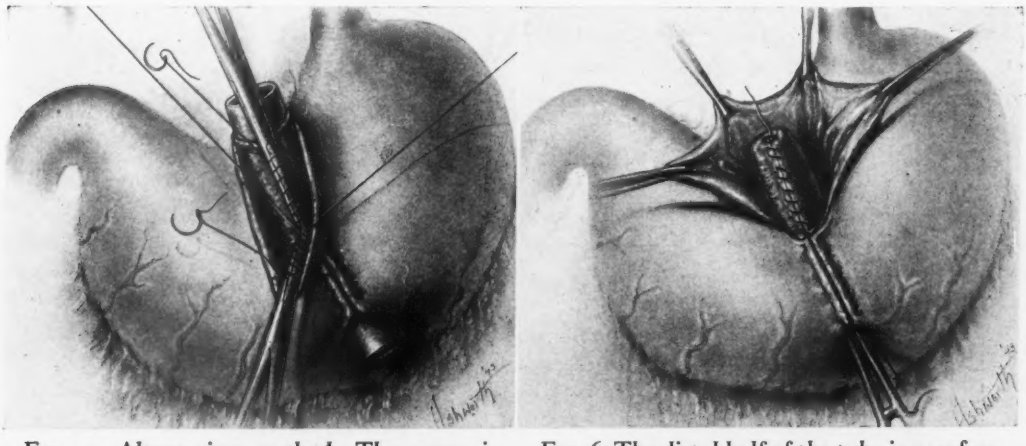

Fig. 5. Alternative method. The same is accomplished as in Figure 4, by suturing of the mucosa over the distal half of the tube between two clamps.

Fig. 6. The distal half of the tube is now free and is covered by stomach mucosa. The proximal half of the tube maintains its attachment to the main body of the stomach. Compare with Figure 3 which shows the original method now discarded.

semi-liquid and liquid. Recently, he vomited swallowed fluid and phlegm occasionally and felt a sensation of constriction which passed up

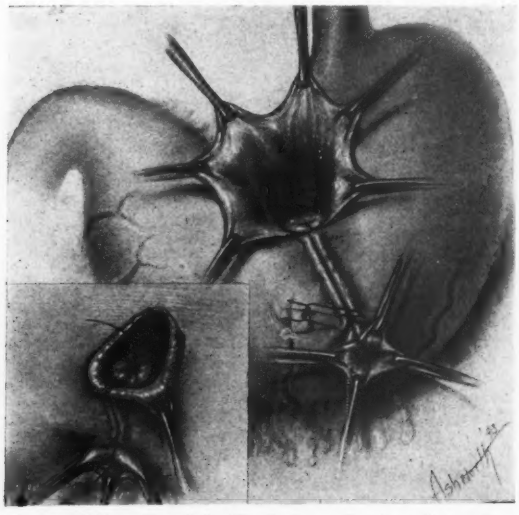

FIG. 7. The distal half of the tube has been invaginated through the serosa lined channel. The opening in the anterior wall of the main body of the stomach is closed by three rows of sutures (not shown in this illustration). Insert: *a*, the valvular gastrostomy is actually shorter than indicated in the main illustration.

from the lower sternum to the neck. The patient's weight had been 140 pounds. His present weight was 121 pounds. As this man had a slight secondary anemia, he was given a blood transfusion twice.

Esophageoscopy on the following day gave the impression of a new growth just above the cardia. No biopsy was obtained. Exploratory operation was performed on October 21, 1942.

A left upper rectus incision was made. A gelatinous carcinoma was found which involved about one-third of the lesser curvature and also part of the abdominal esophagus. Distally, this growth extended to the posterior wall. The tumor was fixed to the posterior peritoneal wall and was considered inoperable because of its extension into the lesser omentum and fixation. There were no palpable metastases in the liver or omentum. A small part of the tumor was removed from the lesser sac for biopsy. The bleeding was difficult to control and was finally stopped by implanting and suturing a bit of rectus muscle to the bleeding area. About three-fourths of the stomach on the anterior surface was free from any growth. A gastrostomy was performed of the type picture in the illustrations. The patient made a good recovery. He was able to take food by mouth and tube three days following surgery. The patient has been seen on several occasions since the operation. He introduces the tube into the stomach through the gastrostomy opening during feeding time. No leakage has ever taken place through the gastrostomy opening.

Pathological report: Mucous cell carcinoma of the wall of the stomach with low grade inflammatory changes.

SUMMARY

A method of valvular gastrostomy is presented which has definite advantages over the original type recently described by this writer.

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THOMAS AQUINAS

INCUNABULA MEDICA VII

FELIX CUNHA, M.D.
SAN FRANCISCO, CALIFORNIA

TO Thomas Aquinas, physician, philosopher, priest, scientist, the most famous of the early religious philosophers, the greatest thinker of the thirteenth Century, modern medicine is deeply indebted. In his hands rested the medicine of the Middle Ages, and his carefully prepared translations and handwritten manuscripts transmitted down through the agency of the religious order to which he belonged, to be collected and later put into print as soon as the press was invented, formed the link between the medicine which had gone before and that which came after his time.

Essentially, he contributed nothing new to the ideas of the day as to medicinal practice, nor did he cause any upheaval in the prevalent medical thought. As the medicine of the time was in the hands of religious philosophers; and as philosophy and religion were considered inseparable, the speculations of these men in the realm of philosophy were closely tied to the field of medicine.

Only two "dicta" were announced by Thomas Aquinas medically and to these he adhered. They were not new and were but repetitions of what had been announced by others. One was that the body was formed by the junction of a material and a spiritual principle, that man consisted essentially of a spiritual mind united to a material body. The other was his belief in the "philosopher's stone," that for which all the scientists and philosophers searched, and which later was the cause of so much fraud and quackery in the centers of learning of the world.

Much has been written of Thomas Aquinas. In church history, of course, he is a shining light. To him is given credit for influencing the church's acceptance of the Aristotelean philosophy, and much of Aristotle's "De Animalibus" was interpreted by Thomas so that it would be acceptable to the proper church authorities. Pure religious history ascribed to him the performance of miracles and great cures, probably invented and built up as a sort of propaganda at the time of his canonization by the church.

He lived in the thirteenth Century, which has been called "the greatest of centuries" because it is believed that more was done for human progress by the men who lived then, than in any other like period in human history. Walsh, in his book on the period, states that it was the source of most that has seemed great and good since then, and that its intellectual achievement has not been surpassed in the seven hundred years since. Thomas Aquinas and Albertus Magnus, his teacher and master, were the outstanding personalities of the century; and as Thomas Aquinas is believed to have surpassed his teacher in his intellectual achievement, so his name stands as the greatest of the time. Henry Adams stated that the works of Thomas Aquinas represent more fully that point of history when man held the highest idea of himself as a unit in a unified universe. Apart from ecclesiastic writings, philosophic literature mentions Thomas mostly as a foundation stone, an interpreter, a pillar on which a whole school of

philosophy depended. Medically, little has been written about him because of the fact, mentioned above, that he contributed no new thought.

Thomas Aquinas was born in Naples and came from one of the most ancient and noble families of royalty in Europe. He could have laid legitimate claim to the title of Prince. On his father's side he was related to the Emperor of Germany, Frederick I and the King of France, St. Louis. On his mother's side he was descended from the famous Tancrede who had conquered that part of Italy known as the Two Sicilies and had reigned over this region.

Situated between Rome and Naples, the city of Aquinas extended in the midst of a vast plain, the value and fertility of which was famous and to which the name "Compagna Felicia" or "Fields of Happiness" had been given.

In the third century, on a peak of bare rock his ancestors, the Counts of Aquinas, had constructed their castle, the castle of Rocca Secca, the ruins of which still exist to testify to their past grandeur. Its walls were extremely perpendicular and seemed to be a continuance of the bare rocks. Forming the foundation base of this rock ran the torrential river Melfo from the gorges of the Appenines. It was here that in 1227 was born the one who would forever make the name illustrious—in science and in religion—Thomas Aquinas.

The saintly religious side of his life has been much written of by ancient priests and modern. The scientific side, however, has been much neglected by his biographers.

Young Aquinas was very early confided to convent care to receive such an education as conformed to the desires of his parents. Fortunately, he was sent to a place known famously far and wide for its teaching and for its contributions to science, the Dominican monastery of Mont-Cassin. It was to this monastery that Constantinus, the African, had consigned to be preserved for following generations his great collection of scientific manuscripts and antiques. It was here that unabated work was carried on to extend the knowledge already gathered over the whole of Europe, and to add to this knowledge by laborious and tedious study and by translation and interpretation of the old classics. It was here that the word "benedictin" originated as a synonym for patient, untiring labor and devotion. Constant additions to the collection over periods of centuries had made the collection of scientific data at this monastery the most precious in all of Europe.

It was the custom of this celebrated monastery to receive a certain number of young men from the greatest families in Italy for the purpose of instruction and education. So to this fountain of knowledge Thomas Aquinas was apprenticed at the age of five years. He was accompanied by a governor who was charged never to allow the youngster out of his sight and whose duty it was to report to the parents daily regarding the health, studies, and activities of his charge.

The young student soon astonished his teachers by the rapidity of his progress, and they in turn found in him rare ability which they determined to develop. He devoted himself with tremendous ardor to reading, retreat and prayer, and study was his constant occupation. This was regarded as being truly remarkable for a child of his age.

"Teach me," he said one day to his teachers, "what God Himself is and all that He is, so that I shall love Him not because He should be loved, but because I am capable of loving Him." That he was indeed remarkable is attested to by the fact that very minute and orderly records of his residence were kept for posterity by the heads of the order and it is these records which furnish the biographical facts of his life.

After spending five years at the monastery he felt that he must have higher studies and of a different nature than those in the program outlined for him by the "Benedectins," and he is found writing to

his father to allow him to leave the monastery and enter some university. The father did not believe that a child of ten years could possibly be equal to the task of studying the grand classics, but held a consultation with the superior of the abbey. The superior, in spite of his regret at having Thomas Aquinas leave, recognized the precocious talent in the boy and advised a great university.

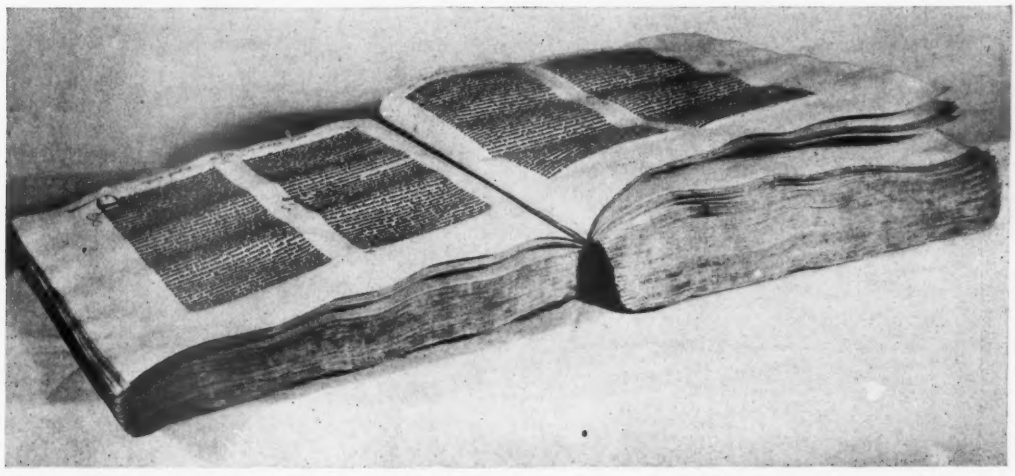

Fig. 1. Represents the first page of the "Catena Aurea," one of the outstanding works of the Angelic Doctor. It represents his work of adapting the doctrines of the Church to the philosophy of Aristotle and is considered as the work representing the highest development of scholasticism. This particular volume was printed in Basle, a free city of the Holy Roman Empire, by Michael Wenssler in 1476, who is considered one of the most distinguished of the early Basle typographers.

It is said that there is in some men a quality of beauty which is like a ray of love and that Thomas Aquinas possessed this to the highest degree, even in childhood. He spoke little and he was habitually serious, profound and meditative; yet, although one saw no sign of humor one did not see signs of sadness in his face. His sympathetic nature was demonstrated by his charity to the needy in the country surrounding his home. When his small child's purse was insufficient for these purposes he demanded money from his parents for distribution to the poor.

After a short stay at home with his parents he was then sent to the University of Naples which was favored over the University of Bologna because of the patronage of the Emperor of Germany, Frederick II. The University was famous at the time for the ability of its professors and the quality of its students. At this time Naples was a city of luxury and dissolution, regarded as a new Babylon. The presence of Thomas here has been compared by his religious biographers to that of Daniel in the lion's den. However, he avoided all temptation, had no conversation with women and none with other students that was not directly concerned with study. His life was spent in attending the daily lectures and then returning to his room to study, to write, and to pray.

His charities continued in Naples and he became noted both for these and for his studies. His reputation began to extend far beyond the borders of the city. He was held up as a model for the students of the University and admired in the city as a model of modesty and charity.

At the age of sixteen or seventeen he decided to retire to a cloister. His fondness for study and the solitary life, coupled with his previous contacts with the friars of the Order of St. Dominic, plus the disorder and dissension prevalent throughout Italy at the time, decided him.

The Dominican fathers were celebrated far and wide for their preaching, their teaching, their example of virtue and

their brilliant success in pushing forward throughout Europe, including Greece and into Asia, the boundaries of their provinces.

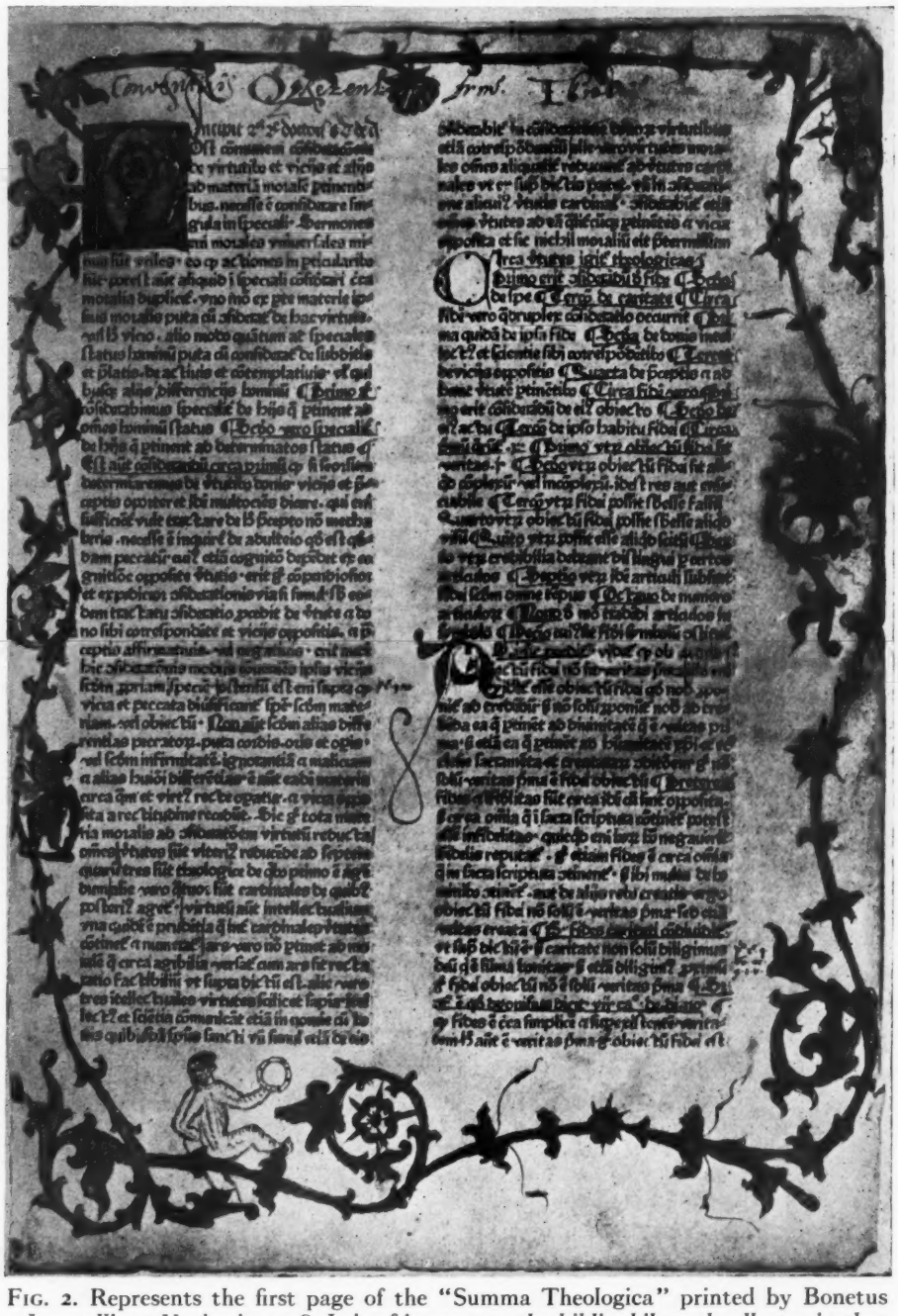

Fig. 2. Represents the first page of the "Summa Theologica" printed by Bonetus Locatellis at Venice in 1498. It is of interest to the bibliophile and collector in that no volume has appeared in any sale in the past ten years, and that it is not found in the majority of the large and noted collections of incunabulae. This volume represents the first printed edition of this work.

This extraordinary prestige and growth was due principally to the methods practiced by the order of instilling into the men among whom they found themselves the qualities of goodness, charity and equality. Above all, wherever the Dominicans established themselves, one saw quarreling ceasing almost as soon as they arrived. It was finally through the Dominicans that the Popes quelled civil riots and commotion in Europe. The rapidity of growth of this

order was attributed to the fact that from its very beginning young men of the most illustrious families were sent there for learning. Among the aristocracy and elite the high and lofty concept of life was accepted as proper, in direct contradistinction to the nineteenth and twentieth century idea, which was to be the opposite.

Fig. 3. A photograph of the "Summa Theologica," showing the binding consisting of pages of incunabulae of the period pasted together to form thick boards. The back is of brown leather with curious markings. It was printed in Basle by Ruppel, a contemporary of Gutenberg's, about 1468.

Thomas Aquinas was completely subjugated, along with many others, by the prestige of the order and he declared that it was his solemn intention to take the Dominican garb and enter as a novice in a monastery. The Count Landulph, his father, and the Countess Theodora, his mother, received this news with despair. They used every means in their power to prevent their son from accomplishing this desire which was absolutely contrary to their wishes. In spite of their resistance, however, Thomas received the habit of the monks in the presence of all the order of that province. His mother had always nourished the hope of seeing her son elevated to one of the highest offices of the Church, but had never dreamed that he would voluntarily renounce the world and hide himself in the obscurity of a cloister. She could not foresee that the talents and virtues of Thomas would eventually spread far and wide throughout the provinces of the Dominicans. There was a possibility that sooner or later he might be called upon to play a great rôle in the world. It was also possible that by his teachings he could obtain an influence more widespread than would be possible for a high dignitary of the Church. But she did not reason thus; instead she resolved to journey herself to Naples and to do everything possible to drag her son away from the humility of a monastic life.

Thomas, on hearing of his mother's decision and of her journey to Naples, sought refuge in another Dominican monastery in Rome, the convent of St. Sabine, situated on top of the Aventin mountain and inhabited by the founder of the order. He made the journey secretly, accompanied by a few brothers of the order and took a different route from that which his mother would take to Naples. The Countess had also been informed of the route of Thomas' journey and, therefore turned about and arrived in Rome a few days after her son. There she begged, then threatened, in order to obtain an interview with him. The interview was refused by the superiors of

the convent and the Countess filled the city with her complaints against the order.

In the meanwhile Count Landulph died, but the Countess, with her strong family connections and her relationship to the Emperor, caused no little trouble to the friars. The Dominicans judged it prudent, in order not to keep this battle flaming, to send Thomas to another monastery of the order. This time he went to a foreign land, namely, to Paris.

At this news the Countess was beside herself and her fury knew no bounds. Thomas had two brothers, Landulph and Reynold, who were in command of troops in the service of the Emperor of Germany, Frederick II, and who were at that particular time engaged in subduing Lombardy. The Countess, who kept these brothers constantly informed of family affairs, let them know that their younger brother was to journey by road to France in order to take his final vows in the order, and she ordered them to use every means possible to intercept him on the road and return him to her under suitable escort.

The mother's wish was punctually executed by her two militray sons. They placed a military guard on all roads by which it was possible for Thomas to enter France. By this time, however, Thomas had accomplished the most difficult part of his journey; he had crossed almost all of the Roman states and was on the point of entering Tuscany. He avoided with great care all cities, but if he found an abbey on the edge of a small town, which seemed hidden and safe, he asked for hospitality for himself and for the brother friars who escorted him. This was granted very readily.

Fatigued by a day's journey, Thomas was seated with his companions resting just outside the city of Aquapendente, when he looked up and saw approaching a mounted army troop fully armed. The young novice had no idea of engaging in any battle and surrendered without resistance. When the commander of the troops approached, he saw that he had been taken prisoner by none other than his brother Reynold, faithful executor of his mother's orders.

Reynold, however, was inclined to step a bit farther than his mother's instructions, so that after capturing his brother, he tried to tear from him by force his Dominican habit. He resisted his desire to do further damage because he did not wish to expose his brutality to his brother before his soldiers. In his partially torn habit or robe Thomas recrossed with his brother's military escort the same territory he had just negotiated, and was returned to the family home. The Countess, overjoyed to find herself at last in possession of her son, whom she loved with all her heart and soul, embraced him and covered him with kisses. Thomas was much affected and responded effusively. Serious conversation was deferred to a later time.

The Countess Theodora neglected no means in her power to make her son change his views in regard to the monastic life. Her plea is quoted as follows: "It is not with any purpose to swerve you from religion that I oppose with all my power your decision while you are yet too young, to imprison yourself in a cloister. Far from it. I flatter myself that sooner or later, thanks to your personal qualities, to your excellent education, to the illustrious name which you bear, and to the friendship with which the Emperor honors our House, you will come to be one of the great dignitaries of the Church, and I live in this sweet illusion. But you say you have made your decision. Without recounting to you what you owe to your ancestors, to their titles, their exploits, their glory, to their illustrious connections, to you, yourself, to your mother who should have some rights to your respect, your affection, or at least to your recognition, you desire to enter this order of preaching friars or beggars without consulting anyone. So then, I entreat you, you cannot enter such a state without slurring your family, without detracting from the glory which your brothers Landulph

and Reynold have acquired at the head of the armies of the Emperor.

"No, I could never allow that a descendent of our illustrious ancestors should hide himself in a cloister, that he should partake of the food, the clothes, the mode of living of the poor, that a young man with a nature, an education such as yours, should hide it in the shadows of a monastery. To satisfy a whim of which you would later repent, to contract a vow which binds you for your entire life, to accomplish an objective, something perhaps good in itself, but for which it is possible to substitute a better one, would you, therefore, willingly cause the death of the one that gave you life? If, while my two oldest sons expose themselves daily to the terrible hazards of war, my youngest son wishes to abandon me, what is there left for me except the grave?"

These words, accompanied by many tears, by evidences of a vital love and tenderness for him, were the basis of the plea made daily by the Countess. The efforts of Thomas to resist these entreaties of his mother caused him great pain, but he remained obdurate. In spite of the passionate discourses of his two sisters and their pleas, which were added to those of the mother, he remained unchanged. He then reversed the situation and preached to them to justify his decision. He mentioned that the peaceful and solitary life of the cloister was that which conformed mostly to the teachings of God. He painted a picture in words of life in a convent so beautiful and so pure that his sisters were convinced by him. They were on the point of resolving to renounce the world themselves if this preaching had continued longer. Following this it was seen that nothing could be accomplished to change his decision so they ceased to oppose him.

Master of his time in the chateau, he confined himself to his habit of study, meditation and prayer. He was unaware the he was not entirely free, and unaware of the resistance which he would encounter as soon as he tried to leave.

The days went by, and Thomas did not tire in spite of his captivity; his brothers finally arrived and found their mother mentally sick and worried. The two officers considered it an affair of honor for the family to make Thomas renounce his decision. As long as good treatment had not prevailed these military minded brothers decided to use other means. Partly by trickery and partly by force, they tried to obtain possession of Thomas' religious robe but Thomas repulsed them with indignation. A fight ensued and the robe was torn to shreds. Vanquished in this unequal struggle, Thomas was confined in the tower of the chateau. Here he remained a prisoner and nothing was neglected to make his confinement a difficult one.

Recognizing that ill treatment was not succeeding in conquering the resistance of Thomas, his brothers adopted other measures. There had arrived at the chateau, probably at the suggestion of their mother and sisters, a very beautiful courtesan, whom they shut up with Thomas. This was perhaps the most dangerous assault which could be made against his youth, but his good resolutions and his virtue triumphed over this method. In order to cut short the situation in which he sensed peril, he seized a hot fire-brand and used it on the fair beauty, who fled with cries of pain. With the same brand, instrument of his victory, he traced a large black cross on the wall of his prison cell and began to pray. At last, exhausted by the effort of this unexpected combat, he fell into a deep sleep. Another plot had been frustrated.

His detention lasted more than a year, but in the meanwhile Thomas had established communication with the heads of the Dominican Order through the intermediary of his sisters. More than once a Dominican was secretly let into the tower. The heads of the order then seized upon a golden opportunity. The Pope and Emperor were on good terms, which was not often the case. The Dominicans devoted themselves to the interests of one and the justice of the other,

but at the same time pleaded with both to free Thomas from his imprisonment.

The Pope was highly indignant on learning that the Emperor's soldiers had dared to chain a "religieux" in the land which was under his authority, and on the other hand the Emperor was highly indignant that this should have been done without his knowledge. He ordered the immediate arrest of the two Counts Aquinas and threatened them with severe punishment if their brother were not liberated at once.

So it became necessary to render unto religion the hero which she claimed. His mother wrote to the head of the Dominicans at Naples, asking him to send to the chateau of Rocca Secca two friars, to whom she surrendered her son. She insisted, however, that his departure from the chateau should be in her own bizarre manner, in order that it might not appear that she was agreeable. The three Dominicans arrived from Naples, waited at the foot of the tower which had served at Thomas' prison. His two sisters at a window had him enter a wicker basket suspended by cords which they held. In this manner he was let down from the top to the foot of the tower into the arms of the Dominicans, "as an angel descended from Heaven." Everything was made to appear as if an escape from the chateau had taken place.

Thomas thus left his ancestral home to enter into the service of God. The object of the Countess in ordering her son to leave the castle in this strange fashion has not been explained, but probably it was pure whim or caprice.

The Pope, wishing to judge for himself of the fitness and ability of Thomas, ordered that he should be assigned to Rome. The Countess Theodora and the two Counts Aquinas accompanied him in order that they might offer explanations and receive absolution from the saintly father for their deed. The Pope interviewed Thomas and after careful consideration decided that he would be allowed to take his vows but only after a probationary period of six months as a novice under the watchful eye of the Pope himself.

It was through the superiority of talent and learning of the members of their order that the Dominicans exerted their greatest influence. The position of their families and the connections from which their members came also made the order powerful. The heads made it a point to attract as many young men of talent and ability as they could discover in the top steps of society. The ability and personality of Thomas Aquinas came to their notice at a very fortunate time and they devoted themselves to develop his talent to the highest degree possible. It was decided at a meeting of the Grand Council of the Order that Albertus Magnus himself should be charged with the religious and scientific education of Thomas.

The General of the Dominicans, therefore, left immediately for Paris with Thomas. After spending several weeks there, they proceeded to Cologne where Thomas was placed in the hands of Albertus Magnus himself.

In 1245, he was again in Paris, following Albertus Magnus there, as the illustrious Dominican had been called to give a series of lectures at the College of St. Jacques. In the midst of the youthful turbulence of the University of Paris Thomas Aquinas, whom Dante in his "Divine Comedy," places at the head of the philosophers of his time, attracted considerable attention because of his taciturn manner and his almost savage-like hypnotic behavior.

He listened with extreme concentration and attention to all of the lectures of the master, Albertus, but if he found himself in the midst of a discussion after a lecture he would never utter a word. To a direct question he would respond laconically, in such a manner that considerable doubt existed as to his extreme wisdom and great talent. He had no desire to associate himself with students of low morals and his general deportment and manners were in direct contrast to the usual habits of students in Naples. His silence was of such

extreme degree, that he was wrongly judged; this voluntary silence was thought to be a screen for stupidity and he was given several uncomplimentary nicknames: the deafmute, the Dumb Ox, the Great Ox of Sicily.

Albertus, hearing whisperings and being aware of what was taking place, decided to assure himself as to the progress of his pupil. One day in the presence of his fellow students he asked Thomas many questions, none of which were easy nor were they possible of answer unless one were prepared and had actually studied. Thomas, however, replied with such reasoning and wisdom and evidence of profound thought, that all of his auditors, not even excepting Albertus himself, were astonished. Albertus, addressing himself to the others, made a prophetic admonition: "You call him the Dumb Ox, but this ox will carry on such a bellowing as will be heard and heeded throughout the entire world."

In 1248, Thomas, having finished his studies, left Paris and returned with Albertus Magnus to Cologne where he was ordained. From this time on his relationship with Albertus was no longer that of student and professor, but that of friends in whom existed a reciprocal affection and devotion.

Thomas often in his writings expresses his recognition and his admiration for Albertus. He goes so far as to call him his Divine Master. In one of his books he advises, "Follow then the divine Albertus Magnus, my teacher." He also says: "If you have constantly before you the rules given you by Albertus, you will have no need of seeking the great nor the royal, but the great and the royal, on the contrary, will seek you out."

In spite of his liking for constant seclusion, Thomas, obedient to the wish of his superiors, was obliged to devote his time to preaching and teaching, the fundamental objects of the Order of Dominicans. But although he preached and gave lectures in theology, he did so solely for instruction and not for enjoyment. It is said that he acquired such an easy style of diction and language that in composing his works it was possible for him to dictate to three or four secretaries at the same time and on as many different subjects.

In 1252, he was went to Paris to give some public lectures on his way to Rome to be promoted in the Order. The examinations for promotion were difficult in those days and consisted of a number of audiences at which a candidate was required to demonstrate his special fitness and aptness in teaching and expounding theology.

As a result of these examinations he became a Professor in the University of St. Jacques; although he was still quite young he was from the very beginning classified among the most learned professors at a time when the faculty consisted of many men of outstanding ability. The Pope, Alexander IV, at the time of his examination, noted and admired the calmness and moderation of Thomas, who, always master of himself, confined himself entirely to repudiating the opinions and facts of the opposition without ever indulging in personalities and not once replying to the words and insinuations of his adversaries. He simply cited his reasons and opinions with gentleness but firmness. He remained in Rome until 1255, then returned to Paris. The favorable impression that he had left behind him in Rome prompted Pope Urban IV to recall him to Rome. He was given the task of preparing to institute the "Feast of the Holy Sacrament." At this time Thomas composed a poem, "The Lauda," some other verse, and the hymn, "Adoro te."

He did not return to Paris again until 1269 after the death of Pope Clement IV. This Pope had named him Archbishop of Naples, but desiring to be only a simple priest he had refused this honor. He had also refused the directorship of the Abbey of Mont-Cassin which had been offered him by Pope Innocent IV.

One day he entered the private chamber of this Pope while he was counting a very large sum of money. "See," said the Pope,

"the Church no longer belongs to the time when she could say 'I have neither gold nor silver.'" "It is true, Holy Father," replied Thomas, "but also she cannot say to the paralytic, 'Rise and walk'." The pious Dominican had pushed aside all earthly ambitions and was able to reply so freely to the supreme chief of the Catholic faith.

During the time Thomas was in Paris, King Louis, who held him in great esteem, often invited him to the palace to dine. It was with considerable distaste that Thomas tore himself away from study and seclusion, but he had a marked respect for the King, and it was out of pure deference that he accepted these invitations.

He was not indifferent to the true manifestations of esteem which he received from persons of honorable character. During a mission which he was entrusted with at Louvain he was honored by the Duchess of Brabant, a brilliant woman who appreciated and loved to associate with men of talent and ability. The Duchess was charmed not only by the modesty and extreme simplicity of Thomas but by his vast amount of knowledge.

In spite of his extreme simplicity, there was in the carriage of the celebrated Dominican a true distinction. He was tall, extremely pale, with a deep forehead and shaven head. He suffered considerably from violent stomach cramps, which were probably due to his extreme fasting and the constant meager diet of his own choice.

In 1272, he was again in Naples teaching theology. Two years later Pope Gregory X invited him to go to Lyons to take part in a conference which had for its object uniting the Greek Orthodox and the Roman-English Churches. He was feeble and sick, and expressed a desire to see his niece before leaving Italy for France. At her home he fell ill and in a few days the illness assumed alarming proportions. Feeling that his end was approaching, he asked that he be taken to a nearby abbey where he died March 7, 1274, at the age of forty-eight years. There is a story which still exists in Italy that the great theologist had been poisoned while en route, by emissaries of Charles II, a prince noted for his crimes.

Thomas was canonized as a saint by Pope John XXII in July, 1323. The Church also named him "the patron saint of schools."

When the University of Paris learned of his death they hastened to write to the head of the Dominican Chapter at Lyons, asking for his remains for burial. It is not recorded what reply the Dominicans made to the University, but the friars of the abbey refused to surrender possession of the body. It was not until 1369, under Pope Urban V, that the remains of Thomas were moved, ninety-four years after his death. After considerable strife between the Dominicans of Naples and those of the French monastery in Lyons, feeling was so high that the Pope judged it expedient, in order to ensure the safety of the body, that it be sent to a Dominican convent away from Italy. He designated the monastery at Toulouse to receive the precious remains. First, however, parts of the saintly body were distributed to different places considered consecreated because he had at some time dwelt there or had added to their glory. Thus the right arm of the doctor-saint was deposited in the Convent of the Dominicans in the Rue St. Jacques in Paris where he had written so much. The other hand was deposited in the Convent of Salerne in the city of Naples.

We arrive at an examination of the scientific works of Thomas Aquinas. His complete works consist of not less than seventeen volumes. Two volumes were entirely scientific, twelve volumes were on philosophy and the remaining three volumes on theology. His teaching and objective was the same as that of Albert the Great, whose pupil and friend he was. Demonstrating the existence of God by describing the harmoniousness of the assembling of the world in its creation and by founding the studgy of theoloy upon the

study of nature, his scientific experiences, observations, and reasoning were the result of this work. The greatest part of his theories, dogmas, material, etc., was derived from Aristotle, Galen and the Arab, Avicenna.

The physics of Thomas Aquinas was only an exposition of that of Aristotle, as Thomas himself admitted. He added only long commentaries of his own in his "In Octo Libros Physicorum Aristotelis Expositio." He made considerable studies on the theories of force and the laws of motion. He believed that the extremely exact harmonious adjustment that existed between all things and all beings, this unity of plan which we see in the whole and even in the minutest details, made it necessary to presuppose a supercentralized direction, without which these conditions of order and harmony, this coördination of movement, these fixed and permanent laws of motion and force could not exist. In those times, such conditions and laws, as well as the observations and commentaries upon them, though purely metaphysical, constituted the realm of science and philosophy. It was, however, by speculation and through the collection of facts that science progressed. Thomas' commentaries on thirteenth century astronomy helped to advance toward the sciences of physics and chemistry as they are known today.

In his book on meteorology, a work of considerable size, he speaks not only of the varied phenomena of the atmosphere, but about comets, shooting stars, etc. His observations, of course, were not entirely correct, but it should be taken into consideration that he was somewhat handicapped in the means available to test out any of his theories. The sciences of physics and mathematics were also not sufficiently advanced at this time to give him help.

Another of his books, "The Nature of Minerals," merits attention. He mentions here the possibility of the manufacture of artificial stones, and he states that it is possible to imitate precious stones to such a degree that experts can be misled. He indicated the methods by which imitations of sapphires, emeralds, rubies, and topazes might be made. "Poteris quemlibet cristallem diverso modo colorare."

Throughout all of this scientific work, experimentation and speculation there was one objective only in the mind of Thomas Aquinas—to create a firm and solid foundation upon which to develop a true dogmatic theology; to this he devoted twelve volumes. It is not to be supposed that his "Summary of Theology" was an immense collection of mystical ideas, of superstitions, dreams, or of reasoning without any definite object. One finds a volume "The Metaphysical and Moral Order," devoted almost exclusively to material things, but the mere shutting out of metaphysical phenomena cannot deny the existence of such.

Theology had for its object the study of different observations from the standpoint of metaphysics, morals, intellect, and the allying of these objects or observations with a primary cause, God.

It is said that if his "Summary of Theology" were to be studied by philosophers without religious prejudices, from the standpoint of a non-biased philosophic study, it would be found that these volumes were the result of a very profound reasoning and careful observation and study, rather than just a collection of purely metaphysical speculations and comets.

There were two Thomas Aquinases, the one of the Church and the one of Science, the legendary person and the historical person.

The Church of Santo Dominico in Naples is situated near the University and is one of the richest churches in Naples. Of its numerous chapels two are dedicated to the "Patron Saint of Schools." In one of the chapels St. Thomas in a marble bas-relief is shown at the moment when, according to Catholic legend, Christ appeared to him to thank him for having written his "Summa Theologia" and is saying these celestial words into his ear:

"You have written well of me, Thomas." Underneath, almost invisible because of age, are three heads surrounded with halos, those of Christ, Thomas, and Mary.

In another chapel, more richly ornamented, considerable gold being interspersed with the marble, are two magnificent tombs, one superimposed on the other. These are supposed to be the tombs of Thomas' two brothers, the two hard brothers who tried by force to keep Thomas from his saintly destiny. There is also in the same chapel the tomb of Thomas' sister, who, converted by his example, also entered a convent and chose a religious life. Many valuable paintings done by Italy's masters through the later centuries, depicting various events in the life of the Saint, form the walls of this chapel.

In the sacristy of the church in a silver frame, one sees a page of lines written by the hand of Thomas. Adjacent to the church is the monastery of the Dominicans of Naples, where Thomas spent so much time in study, meditation and prayer. Today the cloister of the Dominicans is used as a municipal school by the city of Naples. Such is the inevitable march of progress. Monuments to science, religion, and history fall before the economic needs of modern society.

Osler, in his "Incunabula Medica," does not list any of the works of Thomas Aquinas, although in his summary of thirteenth century medicine he mentions him.

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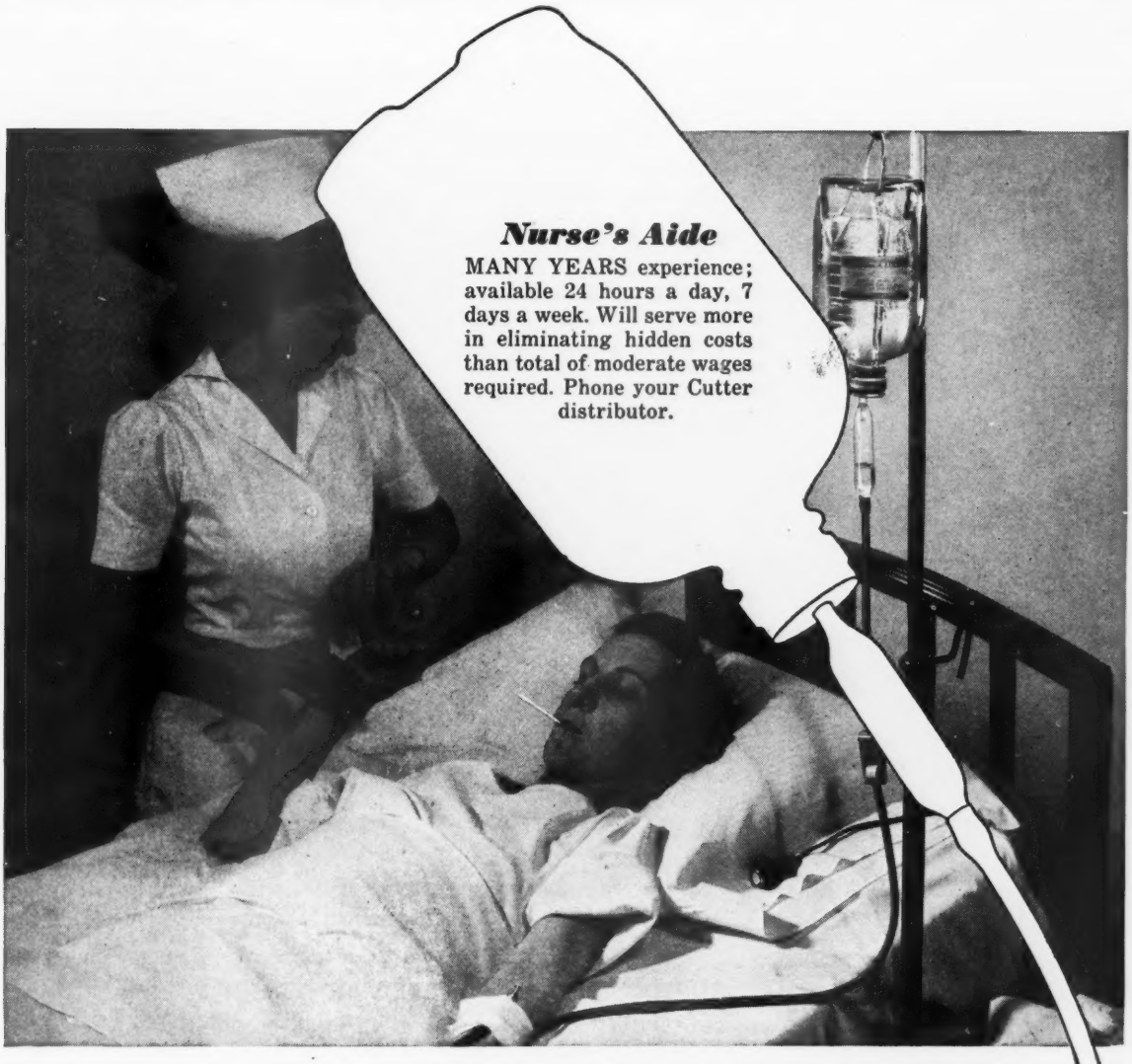
The brief excerpts in this issue have been taken from "Minor Surgery," edited by Humphry Rolleston and Allan Moncrieff (Philosophical Library).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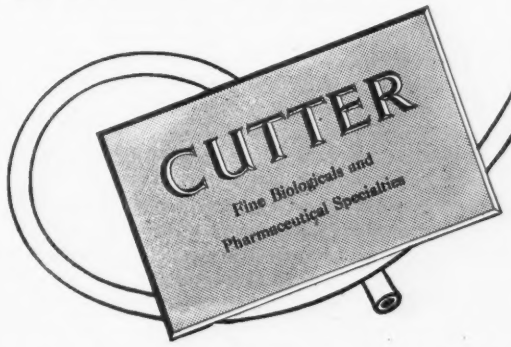

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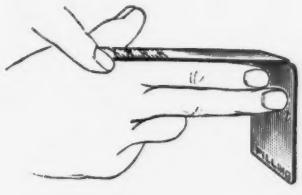

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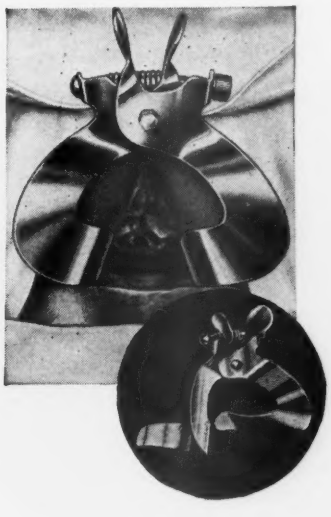

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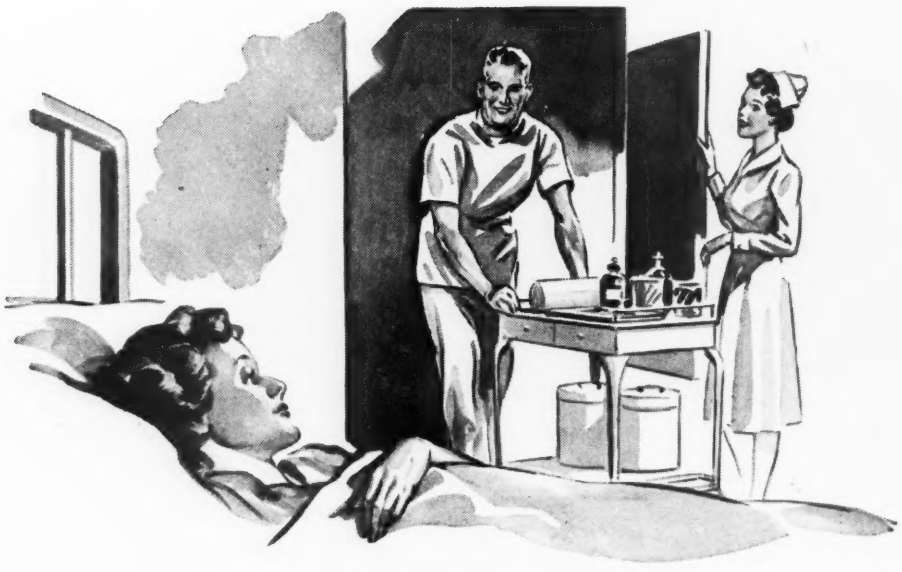

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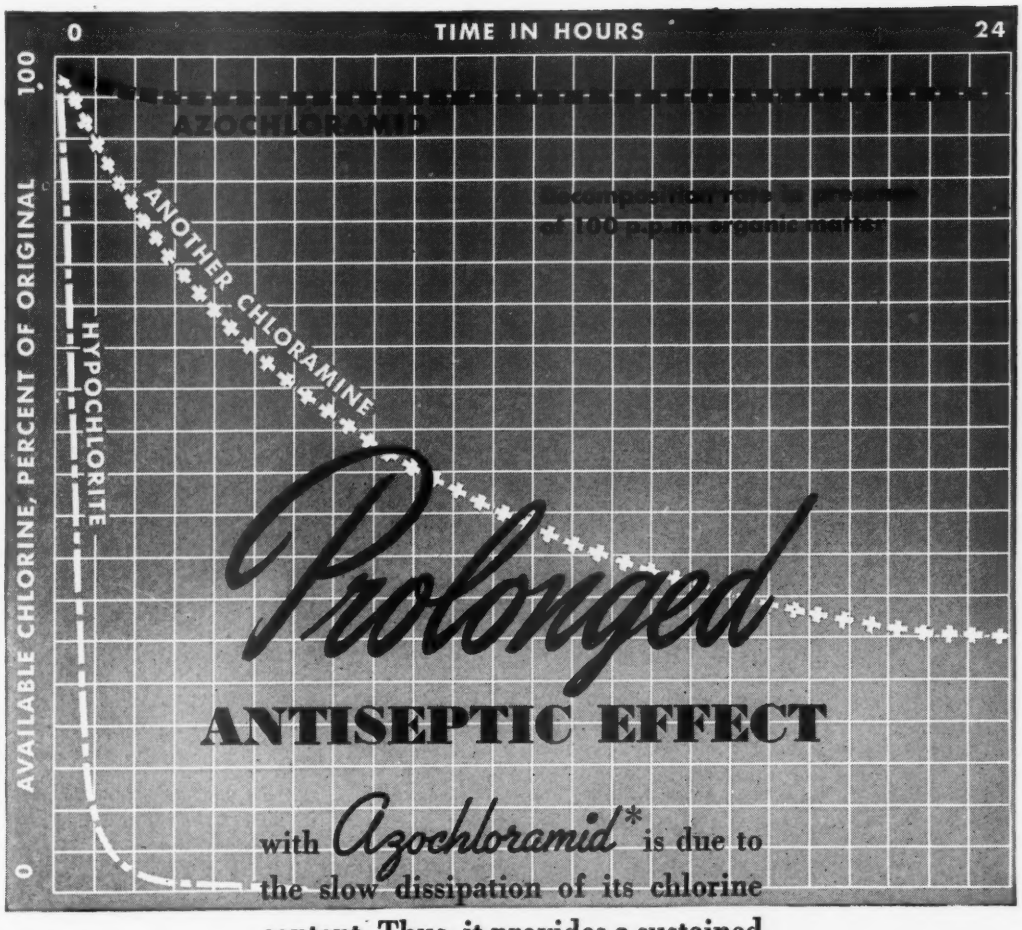

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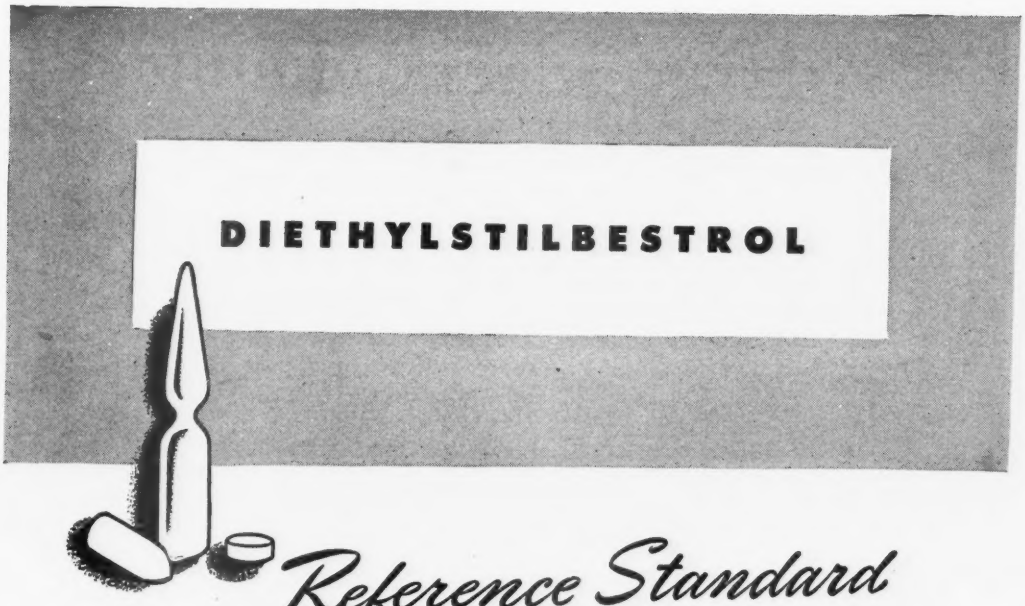

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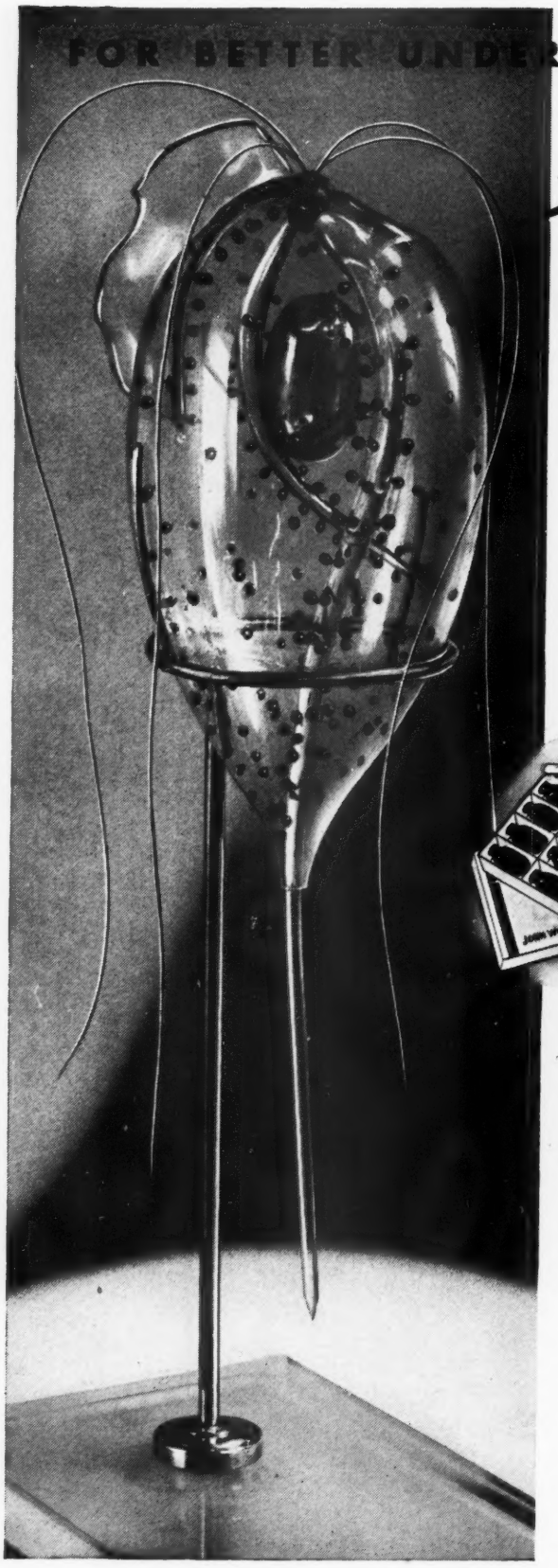

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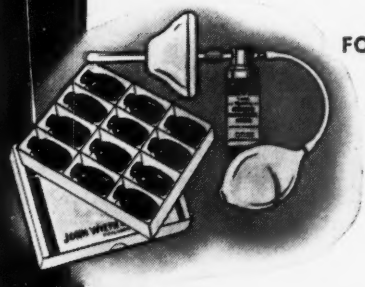

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*Hardin, P. C.: South. Surg., 10:301 (May) 1941

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